

PR1
552

HARVARD UNIVERSITY



Library of the
Museum of
Comparative Zoology

**PROCEEDINGS AND
TRANSACTIONS OF THE
BRITISH ENTOMOLOGICAL &
NATURAL HISTORY SOCIETY**



PRICE:

£ 4 - 50

DECEMBER 1968

Vol. 1 No. 2

Acting Editor:

E. P. WILTSHIRE, C.B.E., B.A., F.R.E.S.

Assistant Editors:

M. W. F. TWEEDIE, M.A. T. R. EAGLES

R. W. J. UFFEN, F.R.E.S.

Papers Panel:

T. R. E. SOUTHWOOD, D.SC., M.I.BIOL, F.R.E.S.

C. N. HAWKINS, F.R.E.S. T. R. EAGLES

MEETINGS OF THE SOCIETY

are held regularly at the Society's Rooms, but the well-known ANNUAL EXHIBITION takes place this year on November 1st in the Conversazione Room at the British Museum (Natural History). Frequent Field Meetings are held at weekends in the Summer. Visitors are welcome at all meetings. The current Programme Card can be had on application to the Secretary.

LARVAE OF THE BRITISH LEPIDOPTERA NOT FIGURED BY BUCKLER

PART VIII

Compiled and Illustrated by G. M. HAGGETT

FOREWORD

This part is the largest of the series. Its appearance in the covers of a single issue is due to the kindness of Mrs. MARGARET MERE, who has undertaken to provide for the colour plates and accompanying text as a tribute to the memory of her husband the late ROBIN MERE. His name appears often in the text, for he was untiring in his efforts to obtain for me those larvae newly discovered in Britain. He assisted, too, in meeting the cost of producing more than one of the earlier parts. I am proud to associate this work with his name and am sad that he did not live to see its completion.

G. M. HAGGETT, 31st August, 1968.

RHYACIA SIMULANS Hufnagel. THE DOTTED RUSTIC

The occurrence of *simulans* in Britain has a curious pattern, peculiar both for its distribution and for its irregular appearance and long flight period; it seems to be mainly an insect of certain western and northern counties, for with the exception of rare appearances in Surrey, Hertfordshire and Buckinghamshire, it has not been recorded from either the eastern or south-eastern parts of England, any further east than the Isle of Wight, although from further north Barrett (*Lep. Brit. Isles* 3: 376) recorded it from Yorkshire. It is present in Ireland (rare), North Wales, Isle of Man, Scotland, and in the Hebrides, Orkneys and Canna, and in Northern England, but English collectors perhaps know it best from the mid-western counties of Somerset, Dorset, Gloucestershire and Wiltshire; and it has been more regularly obtained at Portland and on the Cotswold Hills than elsewhere, yet little is known of it from Devon and Cornwall. It is a species that may remain scarce for years and then appear in numbers sometimes in one particular locality, and at others over a larger part of its range. In recent times its most remarkable appearance was in 1943, when it was reported to be abundant in the Cotswolds. Like *Spaelotis ravidia* Schiff. and some *Triphaena* the moth may occur in any month from June until late September, and it is possible that some form of aestivation is undergone and indeed may be necessary for the eggs to mature. Barrett gives a fairly full description of the larva (after Reid) under the old name of *pyrophila* Schiff. but no figure. In 1957 Mr. R. C. DYSON and Dr. J. V. BANNER were kind enough to give me some of the young larvae they were rearing as progeny of a moth they had caught at Portland. While still very small the larvae were ochreous brown and bore a series of miniature dark markings along the dorsum, and as they grew so the markings darkened and the lateral wedge-shaped lunules became stronger. They were at all times very restless and sensitive to light and vibration. They were reared in rather warmer conditions than outdoors. These larvae were reared throughout on *Poa annua* L. but few

reached full growth and none produced a moth; it would seem that grass alone is insufficient and that low growing plants, such as dock and dandelion, are better foods as some writers have earlier suggested.

Description of the last instar. Length to 43 mm. Shape very cylindrical and thickset with taper only at the last abdominal ring. The general pattern is dense sooty-brown markings on a pale buff ground, and grey below the broad stone-coloured spiracular band which is continuous from the first ring to the anal claspers. The dorsal line is fine and pale, and weakly expressed, being mostly obscured on the thorax, on the abdominal rings it bisects a series of dark brown diamonds, each of which bears at its outer corners a pair of short intensely black streaks that extend forward almost to the ring in front. These streaks begin in miniature on the first abdominal and become progressively larger until the eighth, where they are produced towards each other to form a delicate urn-shaped figure. Each streak is relieved immediately behind by a bright pale cream dot that stands out boldly from the sombre hues of the main colour scheme. On each of the first eight abdominal rings there is placed immediately above the spiracular band a dark brown lozenge that is extended forward and swept upwards, and which is associated with an oblique pale patch above. Head large, rounded but flat in front, a dark brown stripe to each side of the clypeus converging to form a broad uniform band above it, and another vertical dark streak to each lobe. True legs and prolegs greyish. Prothoracic plate dark purplish-brown, dull and not shining, crossed by a narrow weak dorsal line and by broader pinky-white subdorsals. Anal plate ochreous, weak, darker freckled. Tubercles tiny, black, each with a minute, weak hair. Spiracles oval black hoops pale centred, situated at the upper edge of the spiracular band.

Figures: Plate I, fig. 1 nine weeks old; fig. 2 twelve weeks old; fig. 3 and 6 last instar 19 and 26.i.1958. Reared on *Poa annua* L. *ab ovis*. Portland from female moth taken by Messrs. Dyson and Banner.

PRODENIA LITTORALIS Boisd. MEDITERRANEAN BROCADE

This is not a species that is indigenous to Britain and until 1963 it had appeared only as a chance imported larva in fruit, chiefly bananas, from tropical regions. The moth recorded at Runton, Norfolk, on 17.ix.60 is probably the only occurrence of the species in this stage in Britain before the glass-house escapes of recent years. It was formerly known under the name *litura* Fab.

Larvae began to be discovered in 1963 on glass-house grown chrysanthemums in nurseries over southern Britain as far apart as Norfolk to Glamorgan and Worcester, and along the south coast from Essex to Somerset. There were two records from Scotland. By the late autumn it had become evident that a considerable pest had arisen as a threat to the cut-flower trade. The pattern of introduction appeared to derive from a major importer of chrysanthemums who had begun to bring in by air rooted cuttings grown in the Canary Islands and in Malta, and who

had unknowingly introduced the insect from cuttings from the Canary Islands. Infested cuttings had been imported during the summer and had been distributed to other nurseries, many of which grew especially for the cut-flower trade, and there was next the likelihood that the following year's tomato crop might become infested, causing the Ministry of Agriculture to become interested. In the Canaries tomatoes are subject to severe *Prodenia* attack, and in Britain the same glass-houses that were growing chrysanthemums during the autumn and winter would grow tomatoes in the following summer. Nurseries that had received plants from this infested source were traced and all suspected stocks of plants were subjected to prolonged cold treatment that brought about the death of *Prodenia*. Quarantine measures were begun to ensure that all future imported cuttings were free of the insect. By the early summer of 1964 the outbreak was thought to be over, the stocks of plants having been chilled or left at outdoor temperatures during the winter; but isolated occurrences continued into the summer, the best-known being at Portsmouth. After this the species died out everywhere except in laboratories of research stations, and here the original glass-house stocks had become continuously inbred and sometimes mixed with newly introduced control material from abroad.

Surprisingly little notice was taken of the outbreak in entomological journals. J. M. CHALMERS-HUNT (1964, *Ent. Rec.*, **76**: 59, 199) gave the first accounts, and in January, 1964, the Ministry of Agriculture and Fisheries issued a leaflet entitled "The Mediterranean Climbing Cutworm (*Prodenia litura* F.)" which gave an outline of the life history with descriptions and good illustrations of all stages. A brief account of the early stages was given in *Proc. S. Lond. ent. Nat. Hist. Soc.*, **1963**: 48.

The whole life cycle must be spent at warm temperatures and then it must be passed very quickly. The tiny eggs are laid in pearly batches, frequently beneath the leaves, and they are covered with brown hairs from the parent's abdominal tuft. The newly hatched larva is a dull olive glassy creature with black tubercles, black head, black prothoracic legs and black prothoracic plate; the prolegs are banded in black; stiff short hairs arise from the tubercles. The second instar, and succeeding instars, are fully coloured and similar in appearance to the last instar, but are brighter and have more greenish yellow. The larva pupates in a loose cocoon just under the surface of the soil.

Early experiment found that the species was remarkably resistant to DDT and other common insecticides. A convenient quarantine was found to be to subject stock to 30-35° F. for ten days. The egg stage was the most hardy.

I am indebted to Mr. CLAUDE RIVERS and Mr. CHATELAIN for live-stock, and to Mr. SHEERD and Dr. DUFFEY of the Littlehampton Horticultural Research Station for much information.

Foodplants. The list of plants attacked by this moth is a long one. D. G. STEVASTOPULO names 74 plants (1964, *Ent. Rec.*, **76**: 118), some being listed simply by genera; his list includes such diversities as ground-

nut, wheat, poplar, teak, guava and *Thuya*. In Britain it was found that larvae did not do so well on glass-house tomatoes during cooler months of the year.

Description of last instar. This larva is so very closely related to *Peridroma saucia* Hübn. and *Rhyacia simulans* Hufn. and others of this group of agrotids that one wonders how the species came to be classified with any other noctuid subfamily. Its shape with swollen third thoracic and eighth abdominal segments, tiny head, diminutive anal claspers, thin papery skin, as well as general pattern and colour, all conform to the characters of the agrotids that link the cutworms to the yellow underwings and *Amathes*. Yet E. C. ZIMMERMAN, *Insects of Hawaii* 7 (1958) is the only author known to me to place *Prodenia* amongst the agrotids. Those authors and systematists who have included this genus in Palearctic and European faunae have always put it among the loosely assorted *Apatelinae* (= *Caradrininae* or *Amphipyrrinae*).

At full growth the larva increases to 45 mm. in length but there is much variation in size, depending on the temperatures at which the larva is reared, and some may spin up when only 30 mm. long. The body is cylindrical with pronounced taper from the third thoracic ring to the small head, and there is sharp decline from the eighth abdominal segment with the anal segment very small. The skin is soft and thin, and it appears quite smooth to the naked eye; under a strong lens sparse short hairs are visible. When resting the larva can retract the head and prothorax and swell the thorax, so throwing the eye-like markings there into prominence. The head is small, longer than broad, rounded, flattened in front, smooth and shining, studded with sparse black hairs, the colour is deep dark brown or chestnut-brown shaded blackish on the lower lobes, the clypeus edged by a crisp white line. Prothoracic plate dulled, smoky-grey, broadly semicircular, bearing weak ochreous dots and transversed by a very faint dorsal stripe, its anterior margin bears a larger orange spot at the positions of the dorsal and subdorsal stripes; in some examples all three stripes are present on the plate. Anal plate large, red-brown, dotted with white flecks and bearing a few strong black hairs. True legs grey but heavily sclerotised to appear black laterally and bearing fine hairs. Abdominal legs yellow and carrying above a broad and shining dark brown ring. Anal claspers conspicuously bright yellow and orange mottled, displayed behind when at rest, slightly hairy.

The body colour is predominantly a rosy purple-grey with darker lateral and dorsal bands. Along the back the ground colour is pale pinky grey, sometimes inclined to cobalt or lilac; there is a weak pale dorsal stripe that runs from the edge of the prothoracic plate to the large eighth abdominal ring, but the line is partly obscured in all specimens and totally obliterated in the darkest examples; in the brightest marked ones the line appears faintly orange. The line is contained within a dark grey band that is swollen on each segment to form a series of broad lozenges. Laterally there is a broad velvety grey sinuous band that arcs upwards at the centre of each ring; the band is faintly edged above by an incomplete wavy black line that in some individuals is tinged with



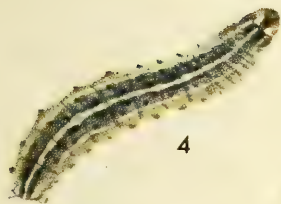
1



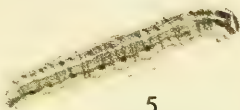
2



3



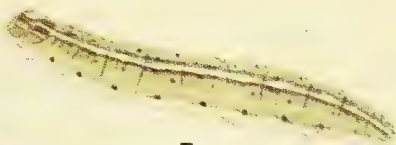
4



5



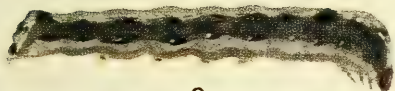
6



7



8



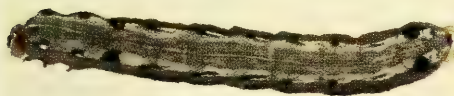
9



10



11



12

Figs. 1–3 and 6 *Rhyacia simulans* Hufn.; figs. 4–5 and 7–8 *Apamea infesta* Ochs.;
Figs. 9–12 *Prodenia littoralis* Boisd.

orange. At the centre of each ring there is a deep black dash extended posteriorly by this fine black line and the illusion is given of a curved streak. On the third thoracic and eighth abdominal rings this black mark is greatly enlarged to form a deep velvety patch, semicircular on the thorax and almost triangular on the abdomen. The abdominal rings 8-10 display dorsally a broad pale oval patch that encloses a dusky irregular pattern and there is a sharp black spot to each side; these rings are deeply folded, unlike the rest of the abdomen which is smooth and plump with no obvious segmental folds. Below the lateral band there is a broad pinkish subspiracular band that becomes orange on the thorax, and the skin is much folded with a fleshy cushion above each proleg.

The second thoracic ring carries dorsally a conspicuous black patch surrounding a bright orange dot and there is another black dot laterally. The third thoracic ring has only a smaller black and orange dorsal dot. Ventrally the larva is a delicate rosy-grey, the skin folds deep pink as in the skin between the prolegs.

Spiracles large, oval, black, set centrally on a black line where the lateral and subspiracular bands meet, the abdominal spiracles each have a bright white dot placed immediately to the rear.

All the body colours are composed of minute irrorations and under a moderate lens they appear as pale mottling on dark skin or dark mottling on pale skin, but to the naked eye the appearance is a uniform soft velvety hue.

The prominent features of this larva are the large black dorsal blotches, the contrasted lateral bands and the soft fleshy humps of the last abdominal rings.

Although the majority of larvae are dull, sombre creatures there is a very handsome form in which the rosy ground colour of the dorsum is relieved by bright orange dorsal and subdorsal stripes, the latter also being flecked with brighter yellow at the centre of each ring, and the adjoining black streak is greatly enlarged to form an elongated triangle. In addition the dark band each side of the bright dorsal stripe is coloured blue-grey. This form can be likened to *Cerastis rubricosa* Schiff. and when fully grown is not at all unlike *Triphaena pronuba* L.

Figures: Plate I, figures 9-12, all last instar, 21.vi.1964 and 26.vii.1964 on *Chrysanthemum* and dandelion. Inbred from larvae obtained at Nazeing, Essex, glass-houses the previous autumn. Originally an accidental import from the Canary Islands. From C. RIVERS.

DIARSIA FLORIDA Schmidt. FEN SQUARE SPOT

The 1961 edition of SOUTH'S *Moths of the British Isles* (p. 146) sums up about all that is known of this insect in Britain. In the years since recognition of the Askham Bog moths the insect has been reported from widely separated parts of Britain, mostly north and west, from Isle of Mull in west Scotland to Newtonmore, Inverness-shire where HARPER says it can be "common in June." From Wales it has been taken in Cardiganshire and at Bala, Merionethshire. In southern England only from Cambridgeshire and the Broads, with a solitary moth at Folkstone

1958. In *Ent. Gaz.* **17** (1966), 40-41, the Rev. VINE HALL has commented informatively on the occurrence of single brood and double brooded insects in Westmoreland and Cumberland and he questions the occurrence of *florida* and *rubi* in Scotland and elsewhere north of the Lake District.

There are no constant differences between the adult insects of *florida* and *rubi*; *florida* is argued to be generally larger, paler, pinker and with better defined markings. There are no differences between the genitalia. Both are said to occur together in some localities and abroad; *florida* is sometimes thought to be a marsh, fen or bog insect while *rubi* has a general distribution. Yet much is made of the supposed difference in emergence periods, *rubi* being double brooded and flying in May-June, July-September, while *florida* is reckoned to fly only in the late June and July period and to be single brooded. Goodson (*Ent. Gaz.* **2** (1951), 71-74) suggested that *florida* came to MV light only late at night and was not to be had at sugar.

CLASSEY (*Ent. Gaz.* **2** (1951), 71) stated that *florida* was easy to rear, the larva feeding rapidly on Dock, and readily 'forced' to produce an autumn brood. Early accounts from abroad reckoned there was a difference in appearance between young larvae of the two insects but not when larger; COCKAYNE wrote "Stange (1886 *Stett. ent. Zg.* **47**: 279) emphasised the different colouration of the young larva before hibernation, which in *florida* is decidedly more reddish yellow and brighter, in *rubi* dark reddish brown. After hibernation the difference is less apparent and the variability make it impossible to distinguish them with certainty at this stage." E. W. Classey was good enough to send me four larvae said to be offspring of a *florida* female and these in last instar were all alike and all lacked the dark subdorsal streaks that are generally present in larvae of *D. rubi*, and these were duller, less sharply marked.

Description of last instar larva

The mature larva measures 32 mm. long, the general colour is deep ochreous brown, darker on the sides as far as the spiracles. A double dark brown dorsal stripe runs clearly from the second ring to the anal plate, the lines converging between rings to give a chain-like appearance. The subdorsal stripe is also composed of a pair of fine lines but they are very inconspicuous. The space between the dorsal and subdorsal stripes is much darker than the rest of the body. There is no spiracular line but immediately beneath the spiracles is a bold pale cream band centred with darker, and which commences on the first ring as a very narrow streak, becoming gradually broader until it reaches its maximum width on the eighth abdominal ring. Below this band the larva is plain pale brown. True legs light brown, claspers marked with darker, head dark brown with a darker vertical stripe down each lobe that is pale edged on its outside, glossy and shining. Spiracles black, oval, centred in pale brown, those on rings I and II clearly larger than the rest.

Figures: Plate VII figs. 7 and 10, last instar, fig. 9 third instar. Reared from parent taken at Askham Bog, Yorkshire, and fed on *Rumex* (Dock). From E. W. CLASSEY. Figured 10.x.1950 and 15.xii.1950.

HADENA COMPTA Schiff. VARIED CORONET

A plain case for the refutation of the early British *compta* is stated in the *Ent. Rec* 1897 being a report of a meeting of the *South London Ent. and Nat. History Society* at which Messrs. Tutt, Barrett and South discussed the early records. Although SOUTH had evidently been deceived by PARRY, both TUTT and BARRETT were well aware of the dubious history of specimens sent out by Parry and Meek and their fellow dealers: they also pointed out that the *compta* of the early authors was undoubtedly our *conspersa* indicating a confusion in the synonymy which the dealers had exploited. The early records are reviewed by YOUTEN, *Entom.* 1950 **83**: 121 and none emerge with too much conviction; the specimen taken in 1921 was championed by COCKAYNE, like Meek's Howth examples, and when in 1954 Morley actually bred two *compta* from *Silene inflata* on the Sugar Loaf hill at Folkestone, it seemed that THOMAS SALVAGE'S 1921 moth was vindicated. There is, however, an alternative, and to my mind more likely explanation, which we owe to A. J. WIGHTMAN, who knew Salvage well, and who knew also that Salvage, honest enough in the way of dealers of his time, quite usually relied on his memory for the localities of insects in his boxes and put on data labels only when he sent them out, and much of his stock was from sales. Since he sent this insect out as *conspersa* and charged for it as such, there is no case for fraud, but a very strong case for not taking the record too seriously. As a British insect, then *H. compta* dates really only from 1954, when G. H. YOUTEN first caught moths in his garden at Dover. The following year larvae were found in abundance in gardens and nurseries there and by 1951 the moth was taken at Folkestone. It was recorded from Polstead, Suffolk, in 1953 and elsewhere in Suffolk in 1954, and the moth also appeared at Colchester in Essex. The Bishops Stortford moths also date from 1954 and in 1956 it was first seen at Balsham, Cambs. In 1960 it was reported from the Breck, Suffolk and Cambridge, while in 1961 I was told that *compta* has been taken in the Cromer district of Norfolk, for the past two seasons.

Apart from the solitary record of South Devon in 1956 (*Ent. Rec.* **68**: 190) the expansion and movement of *compta* in Britain has been northwards into East Anglia rather than westwards across the south. De Worms (*Ent. Gaz.* **14**: 115) recorded it from the London area in 1962. A point of interest is that Hoffmeyer (*Entom.* 1950, **83**: 194) included *compta* amongst the noctuids that had established themselves in Denmark only in this century. In addition to Youden's own observations on the larva, Cockayne wrote an account of collecting the wild larva on a large scale at Folkestone and of larval behaviour in captivity (*Ent. Gaz.* **2**: 76). The larva feeds in the withered flower-heads and on the pods of *Dianthus barbatus* L. (Sweet William) during July, and when large can be found amongst withered leaves at the base of the plant along with an occasional *H. bicurris*.

Description of the last instar larva

The largest larvae measure up to 33 mm. long. There is rather more taper at each end of the body than is usual in British *Dianthoecia* larvae,

and the head is smaller. Colour an olive-ochreous, inclined in some instances to sandy, others with much grey suffusion along the dorsum, but commonly a dull putty hue. Darker dorsally than at the sides and paler still beneath. Markings are variable but the dusky grey suffused dorsal stripe is always prominent and is indeed the most conspicuous ornamentation of a rather drab caterpillar. In some specimens there is but the simplest pattern of dorsal stripe and trapezoidal dots, while others may show a series of rudimentary chevrons so typical of *Dianthoecia*, running from the fourth to the eleventh rings. I have not seen a well marked larva, but the anterior trapezoidals can be boldly expressed. Thoracic plate light-brown, crossed by a pale dorsal and subdorsal lines. Head pale brown with two darker vertical stripes in front and with darker mouth parts. Spiracles ringed in black, all legs grey-brown to ochreous.

Figures: Plate VII figs 8, 12 last instar, fig. 11 penultimate skin, on *Dianthus*, Dover, 18.vii.1950 from A. J. WIGHTMAN.

HADENA CONSPERSA Schiff. MARBLED CORONET

A widely distributed species occurring throughout the coastal counties of England and Wales, less frequently in Scotland, in the northern Isles, and in Ireland from Cork to Antrim: less often found inland, but still with a wide range of habitat that includes the chalk hills of Surrey, the limestone district of Derbyshire, the Sheffield region, and central Inverness-shire where the moth is associated with *Silene maritima* along the Spey valley. Also in the Scilly Isles. The moth is remarkable for its clinal variation from region to region, though this is less spectacular than in *H. lepida* Esp.

Owing to the fact that larvae of the *Dianthoecia* group of moths are mostly obtained from breeding from indiscriminately gathered seed-pods, there are varied accounts of their foodplants, and this is confused further because several of them will take to the same cultivated plants and may be successfully reared from the egg upon them. In the wild it is doubtful if larvae of *conspersa* have ever truly been found eating *Lychnis* pods. Inland on chalk and limestone soils they eat *Silene inflata* but on the coast they prefer *Silene maritima* wherever both plants occur together. In appearance the larva of *conspersa* can really be confused only with *bicruris* Hufn, from which it can be separated by the spiracular differences given by MACNICOL (*Jowin. am. ent. Soc.* 5 (1941); 38: 42), but this larva is more usually found on *Lychnis*. So far as the *Silene* feeders in the wild are concerned, *conspersa* is a much duller larva than the yellow tinged and more handsomely mottled *rivularis* Fab. (*cucubali*). *H. albimacula* Borkh. is a deeper orange and more heavily freckled, and is confined to *S. nutans* on the Kent and South Devon coast, it occurs in Sussex only where that county protrudes into Kent at Dungeness. *A. irregularis* Hufn. feeds only on *S. otites* in the Breck. *H. caesia* Schiff. is heavily dusted with grey laterally and has dark grey dorsal diamonds, and is exclusively a western seaboard *S. maritima* feeder. *H. compta* Schiff. has rarely been reported from *S. inflata* but is more usually attached to *Dianthus*, and is a more sombre ill-marked larva; *conspersa* has, however, been found on *Dianthus* (*Ent. Rec.* 73: 166).

MYERS has written an instructive note on the foodplants of the group (*Entom.* 1968, p. 35).

BARRETT (*Lep. Brit. Is.* vol. IV, 252) gives a good description of the *conspersa* larva and figure (Pl. 164).

Description of the last instar larva

Length when full grown to 36 mm. Body plump and cylindrical with taper only in the later abdominals, showing the typical *Hadena* features of small prolegs and smooth skin. Colour basically a dull putty hue but inclined to orange or sandy in some specimens and also when younger. Intersegmental folds narrow and frequently orange tinted. The common *Dianthoecia* dorsal pattern of two diverging arms carried forward from the dorsal line varies in intensity in *conspersa*; in its common form it is weakly expressed, becoming well marked only at the dorsal line and between the segments, but there is every development through to the heavily marked dark form in which the entire pattern is deeply etched and much suffused by further dark-brown freckling.

In the darkest form the entire centre of the dorsum between the arms is shaded in to comprise a dusky diamond in which the front pair of trapezoidal warts—so conspicuous in the pale forms—are barely discernible. Similarly, the obscure shading above the broad pale spiracular band in pale specimens may in others become deeply suffused and joined above to the dorsal markings. Dorsal stripe begins on the thorax as a double line but soon becomes darkly suffused and diffused on the abdomen.

Spiracles fine, narrow, oval, brown rings pale centred. Head smooth and shining, pale brown to very dark brown and marked in front with two wavy blackish vertical lines. The legs pale brown, claspers and prolegs pale like the ventral surface. Prothoracic plate pale brown in the paler larvae to dark-brown in the highly coloured forms but always crossed by the narrow white dorsal line. One larva collected from *S. maritima* at Poldhu, Cornwall, was a uniform sombre ebony-brown and the dorsal markings could be detected only with difficulty.

Figures: Plate VII all last instar figs. 1-3 on *Silene inflata*. Storrington, West Sussex, 28.vii.1951, figs. 4-6 on *Silene maritima* Tintagel, Cornwall, 14.vii.1957.

LUPERINA NICKERLII FREYER SSP. *KNILLI* Boursin. IRISH RUSTIC

The species *L. nickerlII* has a curious history in Britain. It was first found commonly as a sand-hill insect along the St. Annes part of the Lancashire coast during the latter part of the last century, but it disappeared before the First World War. A few were taken along the North Wales coast from Rhyl to Deganwy until just before the Second World War, and none have been found there since, and it has not been found from the extensive sand-dune area of Anglesey, where collectors expected to find it. Instead it was next discovered in Western Eire (*Ent. Gaz.* 16: 3 (1965)) on the Dingle peninsula at Inch where it is an

inhabitant of the loose cliffs hard by the sea: this race has been named *knilli* by BOURSIN (*Bull. Soc. Linn. Lyon*, **33**: 5 (1964), 184). A good account of collecting the moth has been given by HUGGINS (*Ent. Rec.* **79**: 281, 1967).

The moth has been reared from the egg by MYERS (*Entom.* **100**: 13, 1967), who with A. J. WIGHTMAN gave me eggs in the autumn of 1965. The following is my own account based on the development from these eggs.

Eggs were laid within the curled sheathing leaves of dead grass stems. The eggs hatched after 14 days and the tiny larvae ate their individual ways out by boring minute holes through the dead sheathing leaf; stems from which a good number of larvae had hatched were profusely perforated. Larvae were put on to whole plants and cut stems of *Poa annua* and the first moult was passed within the grass stems during the last week of September. They fed solely on the soft interior of the stem. A second moult was made about the middle of October and a third during the last week of October. Thereafter most larvae entered hibernation but with a range of at least two instars, some larvae being in their third instar, others in their fourth. Five larvae kept on feeding very slowly throughout the winter at a mean temperature at 50° F. and reached the seventh instar by early March, when the hibernating larvae began to feed again.

I reared 4 larvae through to the moth and 12 others to last instar and found them all to pass seven moults (not including the pupal) but Myers (*ibid*) recorded only seven instars from one individual. The first larva to finish feeding did so on March 27th, it spun a roomy cocoon about twice the length of itself and lay up within for three weeks before pupation. The cocoon was made beneath two inches of loose vermiculite and scarcely any silk was used in its construction, the walls being simply pressed out and weakly cemented. The pupa remained in the cocoon and the moths made their way up through the vermiculite. The later larvae followed a more usual timetable and pupated during June and July.

Habits of larva

Larvae were sluggish at all stages of growth, from newly hatched to last instar. They were disinclined to wander and were unable to climb. When feeding internally they simply ate away the centre of the stem that contained them and when larger they rarely moved from their chamber. The older larvae ate those stems they could reach by thrusting the head from their chamber and only when all available food was eaten did they extend or change their retreat.

Only the white lower parts of the stem were eaten by the older larvae. During first and second instars some larvae lived in the flower heads and ate the flowers and they preferred immature flowers still within the sheathing leaf. The chamber of the larva is really a hollowed out space within grass roots rather than a true cocoon, and the walls are soft and closely woven, not cemented or brittle, the larva presses rootlets and other material at hand (such as tissue paper) into a yielding bag-like structure, but this is so strong that the materials can be torn apart with

the fingers only with great difficulty and risk of injury to the larva. During the last two instars the larva lives within the dense matted fibrous rootlets in dry powdery soil. Its chamber takes the form of a tight fitting cylindrical tube that fits so closely to its body that it can be extricated only with the greatest care, and then by stripping away the girdling walls piece by piece.

The tube is open at both ends, the head is withdrawn in the manner of a caddis-fly larva and the larva ejects its frass through the rear end into the loose soil. When feeding inside the grass stem the larva simply packs frass behind it within the burrow. Older larvae living externally pass a very dry and powdery green frass which is evacuated outside the chamber. The species is remarkable for the very small quantities of frass passed and for its dryness.

Newly hatched larvae bored their way into stems by way of the lower leaf axils, pushing and eating down into the stem, some were given cut stems and these simply ate their way upwards. The full grown larva will thrust its mouth parts upwards when disturbed and will vigorously snap its large, strong mandibles.

Techniques used to rear larvae

Lepidopterous larvae that live within their host plant can be very difficult to rear in captivity: those that live inside small grass stems are especially tricky during the early instars. The problem is to keep the grass fresh and healthy without the need to move larvae from stem to stem, and when tried on a growing plant grass-feeders are rarely seen again. Most internal feeding larvae dislike being turned out of their burrow and the grass and the reed feeders usually choose to stay until death in a yellowing stem. Grass quickly goes limp and loses its attractive succulence when kept in a dry container and the only way in which its life may be prolonged is to keep it in an airtight glass or metal tube or glass phial, but these encourage condensation and mould forms quickly.

A good many of the internal grass feeding larvae take readily to *Poa annua* which is particularly fortunate as this grass is compact, is very common, has a shallow root system and, above all, has a comparatively stout fleshy rootstock that supports a conveniently short leaf: it is available in good condition all the year. If the whole plant is uprooted and most of the soil shaken away the roots can be squeezed and the plant slipped into a glass phial or larger tube where it will remain attractive to larvae for a week or so. The problem of condensation can be eased by wrapping the plant in paper tissues and lining the cork with the same material.

Newly hatched larvae of *nickerlii knilli* were placed on *Poa annua* in glass phials packed in this manner and they were transferred still within their stems to new plants as the old became yellow. As the larvae hollowed out the blanched lower stems they could be fairly easily detected when each stem was held against a bright electric lamp and each larva could be seen within the translucent eaten stem. Tenanted stems were laid against fresh plants and the larvae shifted of their own accord.

As the larvae grew larger and began to live outside the stem so more paper tissue was loosely packed at the bottom of larger tubes, and finally into jam-jars and complete protection was given from mould whilst providing a dark and dry environment. Older larvae were kept solitary but during the first two instars more than one larva would occupy the same stem.

Description of first instar larva

A cylindrical larva with taper at anal end. The skin very glossy with each ring banded in orange, the rest of the body being translucent. Body hairs minute. Head large, dark brown, shining. Prothoracic plate large, heavily chitinized, red-brown semi-circular and peaked in front. Anal plate large, brown, heavily chitinized. Thoracic legs long, dark brown.

Description of fourth instar

The body colour dull ochreous grey bearing a well defined hoop of plum-purple across the back of each ring. Head pale brown. Prothoracic and anal plates large, pale brown, heavily chitinized, the anal with a narrow strip of chitin on the preceding ring. True legs dark brown, prolegs ochreous-grey.

Description of the eighth (last) instar

When fully grown the larva measures up to 25 mm. in length which is very little for so large a creature. This is because its build is shortened and squat and fat rather than long and slender as is more usual in lepidopterous larvae. It is flattened at the thorax, broadest and thickest at rings 4-6 of the abdomen, becoming much flattened and smaller after that. Each ring is about twice as broad as long. The skin is smooth and shining but exceedingly tough and is deeply quilted, no hairs are visible to the naked eye except the sparse fine ones on the head and anal plate. The dorsal vessel can be traced throughout the length of the body.

The body colour is a dull waxy olive-cream and the cuticle is thrown into convoluted relief by transverse folding and quilting of the segments and by the fleshy lateral folding, on the large thoracic rings the lateral folds are darker and resemble plates of chitin. The only ornamentation are the plates and associated bands of chitin.

The prothoracic plate is large and entirely covers the dorsum of the first ring, it is weakly chitinized being coloured pale grey-brown or light brown and is divided by a fine medio-dorsal line but is not well defined at the sides. It is dotted with tiny sparse black hairs each of which arises from a minute tubercle mounted on a pale base. The anal plate is a dark brown heavily sculptured structure, semi-circular when viewed dorsally and very thick when seen from the side, it is saucer-shaped bearing in its depression on the anterior side another smaller replica of itself, so the whole plate can be described as bearing two prominent flanges; the rim of the plate and its internal discs are coloured deep dark brown or black. The anal plate is preceded by a narrow strip of blackened chitin on the ring adjacent to it, which reaches across the full width of the dorsum, and this belt is notched at the position where in other larvae a subdorsal line might run. The belt carries four tiny tubercles. There is another shorter streak of dark grey-brown chitin on the next ring but this is



Figs. 1-3 and 7-8 *Procus latruncula* Schiff.;
Figs. 4-6 *Luperina nickerlii* Frey, ssp. *knilli* Boursin.

broken at the centre and appears as two short streaks, each with a tiny tubercle. The head is honey-brown or red-brown, globular with a broad deep division at the base. It is normally held well into the thorax but when extended, and when the larva moves, the head is seen to be thrust so far forward that the larva appears to be in a moult.

Spiracles are small, oval, black and situated rather forward on each ring, and about halfway down the sides, the prothoracic pair being much larger. Anal claspers dark grey-brown, prolegs fleshy, olive-cream, tipped with small black crochet rings, of little use for climbing or gripping. The true legs grey, the last pair blackish. The skin is remarkably thick and tough, the body is firm and turgid to the touch, it is one of the toughest larva that I have seen.

Figures: Plate II figs. 4-6 all of last instar. Ex ova, female taken at Inch, Co. Kerry, by WIGHTMAN and MYERS, reared on *Poa annua* and drawn 7.iv.1966.

PROCUS LATRUNCULA Schiff. TAWNY MINOR

For many years I have collected *Procus* larvae in April and May from all manner of grassy situations wherever I happened to be in England and Wales. These larvae always produced *strigilis* Clerck and *latruncula* Schiff. also *furuncula* Schiff., but never the insect called *versicolor* Borkh., even although I have collected larvae in situations, e.g., Marlow where *versicolor* is known.

These *Procus* larvae change from stem to stem by night and can be seen by torchlight sitting or moving slowly low down on the grass stems or on the soil debris and not at all on the tips of the blades because the legs are not suited to climbing and the crochets do not grip tightly. The larvae feed internally and enter by pushing into the leaf axil, fairly low down where they eat away the fleshy blanched stem as far as the tough base and root and they leave behind a squashy green frass. They pupate in the ravaged stem above compacted frass and always within a large leafy shoot, and within the shelter of other sheathing blades, but very low down.

P. strigilis and *P. latruncula* larvae appear to be inseparable, both exhibiting variation in the rosy pink ground colour which may be deep maroon or purplish. Larvae with a blanched pallid line are not uncommon but are unhealthy, being infected by a fungus that kills in the last instar. Both species are, however, very distinct from other small internal grass and reed feeders as I have already described in Part VI of this work, *Proc. S. Lond. ent. nat. hist. Soc.* 1961, pp. 142-144.

Description of last instar larva

At full growth measure to 20 mm. long. Head very small, pointed, dark brown with darker mouthparts, ocelli large and prominent in a raised arc. Prothoracic plate large pale brown divided by a clear fine dorsal line, edged darker in front and again but less strongly at the posterior border. The second and third thoracic rings bear two small rounded plates laterally with a further, weaker one above. The anal plate

is large, honey-coloured preceded by a narrow transverse chitinous strip bearing dorsal warts on the posterior of the previous segment. Trapezoidal warts tiny but conspicuous, black, each with a short soft fine bristle. Head and anal plate weakly hairy. Prolegs weak ill-suited to climbing and fast movement, grey in colour. True legs greyish ochreous. Spiracles narrowly oval upright, placed at the centre of the spiracular band.

The ground colour is greyish ochreous at the sides and beneath is flushed with pink, the dorsum is flesh tint and an intensified pink on the dorsal patches. The dorsal stripe is clear grey from behind the prothoracic plate to the narrow strip of chitin on the penultimate ring. Subdorsal stripes pale, well-marked only in darker examples, in many specimens the only markings that can be seen between the dorsal patches and spiracular band are a series of undulating streaks that bisect the lateral space. The dorsal patches are much broken by wedges and streaks of ground colour and the trapezoidal warts stand each on a pale base within these patches. Colour of the dorsal patches varies from purplish to pale rose pink.

The drab pallid pattern of larvae of this genus does not allow easy identification, and the more characteristic feature is the build which is spindle-shaped and swells quickly from the fleshy puffed thorax and is broadest at the third thoracic ring from whence it tapers evenly to the long narrow penultimate ring: other abdominal rings wider than long. The skin is quilted and shining.

Figures: Plate II figs. 1-3 last instar in *Dactylis*, Marlow, Bucks., 18.iv.1959; figs. 7, 8 last instar in *Dactylis*, Farnham, Surrey, 10.iv.1958.

APAMEA INFESTA Ochs. (*anceps* Hübn.). LARGE NUTMEG

Whereas this moth has a universal distribution in Britain extending to the northern isles, and occupying great variety of habitat, it is nowhere really common, although perhaps more often seen in southern English counties. The larva is not to be found with other hibernated *Apamea* species in the meadow grasses and by the way-side, indeed, it remains unknown in the wild state. Some knowledge of the larva was evidently known to the early writers for South, *Moths of the British Isles*, in 1907 could accurately state that the caterpillar "is said to be very like that of *Apamea basilinea* (*sordens*)," which indeed it is. Barrett (*Lep. Brit. Isles*, 4: 349) gives an inadequate description, and no other British author has offered an alternative. To the best of my knowledge Mr. T. G. HOWARTH was the first person, at least in modern times, to obtain larvae, and these he reared from the egg. Like other species of true *Apamea*, *infesta* larvae feed at first on grass seeds and flowers, or on grain, and only later take to grass blades; they are not true subterranean larvae, but they do hide away in the soil and spin there a loose cocoon in which they rest. The legs of *Apamea* larvae are not well suited to climbing and they are in consequence to be found amongst the lower parts of the grass tussocks rather than higher up the stems. They can be found in this manner only after dark. I have in an earlier paper, *Ent. Gaz.* 8: 223, discussed the five species of *Apamea* larvae that appear very much alike, and there

suggested that the chitinised plates of the prothoracic and anal segments provide the surest means of identifying them.

A. infesta is more difficult to distinguish from *A. sordens* Hufn. than the others, but it can still be recognised by its red-brown head, its narrower and red-brown prothoracic plate, both of which are blackish-brown in *sordens*, and by the absence of the suffused black patch which surrounds the lateral warts of *sordens*; *infesta* is rather the more slender larva with a greater taper at each end. The larvae reared by Mr. Howarth were kept indoors and presumably fed up more quickly than in nature.

Description of the last instar larva

At full growth measures 35 mm. long, the body broadest at the centre with considerable taper to the anal segment and less towards the head, a little flattened along the dorsum. The skin very smooth and shining, the intersegmental divisions clearly defined, transverse wrinkling only on the thoracic rings. Colour a dull pale ochreous-grey relieved only by the dorsal stripe and spiracular bands; the dorsal stripe is a bold creamy-white, broader at the intersegmental divisions and again at the centre of each segment, the stripe narrower and less distinct on the thorax, but narrowly margined throughout its length by dusky shading that becomes heavier towards the anal segment. Subdorsal lines merely paler than the ground colour. Spiracular bands broad, stone-coloured, surmounted by a large black wart on all abdominal rings. The spiracles narrow, oval, white and black ringed, accompanied by a small spherical wart, the spiracles placed centrally in their band. Head reddish-brown, shining, marked above and in front by two short dark, vertical streaks. Prothoracic plate pale red-brown, darker between the dorsal and subdorsal stripes, the latter white and clear, the subdorsals mostly obliterated. Anal plate pale, the subdorsals very weak, the conspicuous white dorsal stripe bordered by a dark shading. True legs dark brown, prolegs and anal claspers pale ochreous-grey. Trapezoidal warts along dorsum small, the hairs fine and short, and not evident to the naked eye.

Figures: Plate I, fig. 4 penultimate instar 28.x.1952; fig. 5 immediately after the last moult; figs. 7, 8 fully grown, 30.xi.1952. Reared *ab ovis* at first on wheat grains and oatmeal subsequently on blades of *Poa annua* L., *Dactylis* and *Agropyron* (couch grass), from a moth taken at Arkley, Herts., by Mr. T. G. HOWARTH.

APOROPHYLA LUNEBURGENSIS Freyer

The criteria that distinguish one species from another, or from race or subspecies, are neither constant nor entirely rational, and lepidopterists have become increasingly familiar with anomalies and inconsistencies as species have become split. The decision is frequently one of acceptance by majority opinion, and the argument shifts dramatically between one group and another: on the one hand we have the "genitalia" species as in the genera *Procus*, *Oporinia* and *Hydraecia*, on the other we have *Diarsia florida*, *Eupithecia goosensiata* and *Leucania favicolor* that depend for their recognition solely upon differences in wing facies or habitat.

The case for regarding *luneburgensis* as a separate species from *lutulenta* Schiff., since the original description by FREYER in 1848 (*Neuere Beit.* 6: 72), has been supported by DRAUDT (in Seitz, 1938. *Palaearctic Noctuae*, Suppt. 3, p. 136), by HOFFMEYER (1962 *De Danske Ugler*) and by WIGHTMAN (1955 *Ent. Gaz.* 6: 217), who gives full descriptions and references and who writes, "I find it impossible to accept that if *lutulenta* and *luneburgensis* were but forms of one species, both forms would be so widespread. Local races are surely likely to be restricted in habitat. Yet in this case *lutulenta* is found in England, France, Spain, Germany and Italy among other places while *luneburgensis* occurs in Ireland, Isle of Man, France, Holland and throughout N.W. Germany, etc. Yet the races or species are quite easily distinguishable from each other everywhere."

The occurrence in Britain of the two insects is quite separate, *lutulenta* being confined to the south and east of England; in Wales, Ireland and Scotland it is entirely replaced by *luneburgensis*. In Denmark Hoffmeyer states that only *luneburgensis* occurs.

In his paper Wightman suggested that there might be differences between larvae of the two insects, and the examination of many Scottish larvae since then has borne this out. In contrast to *lutulenta*, the larva of *luneburgensis* is mostly a brightly ornamented creature with black or red flecking relieving the white and cream longitudinal stripes, Wightman has now seen a great many larvae of both insects and he maintains he has never seen such brightly marked forms of *lutulenta*, in which the greatest extent of variation is a tendency for weak maroon edging of the spiracular band and rarely a suggestion of abbreviated black dashes along the dorsum. Larvae of all the British species included in the genus *Aporophyla* vary a great deal in colour and markings, all have plain green examples, normal in *lutulenta*, not too rare in *luneburgensis*, very unusual in both *australis* and *lunula* (*nigra*) but green larvae do occur in all four species, and they can quite easily be wrongly identified. The larva is principally a *Calluna* feeder.

Description of last instar larva

Measures to 38 mm. long, is cylindrical with taper towards the head from the mid abdomen, the skin smooth and velvety, the body rather flattened at the thorax, the head held well under a large prothoracic plate.

Colour a rich, luscious sap-green, intersegmental folds deep yellow, dorsal line always present, usually brightly marked in crimson or black on the anterior half of all abdominal rings except the last two, in some larvae these marking are restricted, but in the best marked examples the line is continuous from last thoracic to the penultimate segment, and is doubled on the thorax itself. The line is not smooth but is coarsely granulated, having a rough powdered appearance. Subdorsal stripe is snow-white, weak on thorax and last abdominal ring, it is edged above in varying intensity in crimson or black, sometimes continuously, more often as a broken border and better marked on the anterior half of each ring.

Spiracular band continuous and broad on all abdominal rings, narrow on thorax and anal segment, band is swollen by fleshy lateral flanges coloured white but heavily obscured in lime-yellow; the band is edged continuously above in deep maroon to form a series of blotches with each patch surrounding the white spiracle. Head olive, unicolorous. true legs grey, prolegs green tipped with pink. and claspers green edged by continuation of the spiracular cream stripe.

Some larvae combine both red and black markings, and this makes a very handsome combination.

Figures: Plate VIII figs. 7-11 all last instar on *Calluna*, Boat of Garten, Inverness-shire, 9.vi.1962, A. J. WIGHTMAN.

LITHOPHANE LEAUTIERI Boisd. THE STONE PINION

The history of this recently discovered British noctuid is given by MERE (1961 *Proc. S. Lond. ent. nat. Hist. Soc.*, 1960: 67) and is also given in South (1961, *Moths Brit. Is.*, 1: 228) where the English name of Blair's Shoulder-knot is first introduced. My own preference is for the name Stone Pinion, this being the name given by BLAIR (1952, *Entomologist*, 85: 123) in his original paper.

At the time of writing (March, 1968) the moth is still confined in Britain to the south seaboard counties, and is distributed discontinuously from Eastbourne in Sussex to Torquay in Devon with odd records from Hants mainland and south Surrey. It remains best-known from the Isle of Wight, and is apparently well established at Torquay.

At the time when KETTLEWELL proved this moth to be breeding in this country it was known to British entomologists by the name *lapidea* Hübn., and all records until 1957 appeared under that name, it was not until the work of BOURSIN became available that the English insect was considered instead to be the subspecies *hesperica* Boursin of a twin species *L. leautieri* Boisd. The subspecies was first described by Boursin (1957, *Bull. Soc. Linn. Lyon*, 3: 62) from moths of west and south-west France, and in particular from the Gironde district. Previously (1957, *Bull. Soc. Linn. Lyon*, 2: 19) Boursin had argued the difference between *lapidea* and *leautieri*, and stated that the English moths very likely belonged to the latter species; in the later paper Boursin discussed the English moths at greater length, having received specimens from Kettlewell, and he re-affirmed his decision that these agreed with *leautieri* s.sp. *hesperica*.

Mr. E. P. WILTSHIRE has studied the two insects *leautieri* and *lapidea* from extensive material from the Middle East, France and Switzerland; he has recently pointed to me that in addition to quite distinct differences between the male genitalia of these insects he has found that the white dorsal stripe of the larva is widely interrupted in *lapidea* but continuous or nearly so in *leautieri*. The larva of *leautieri* usually has, in addition, the subdorsal white markings more tapering and less club-like, and the white spots in the subdorsal and lateral area are smaller and fainter.

There has been the usual speculation on the origin of *leautieri* in Britain. WARNECKE (1959, *Entomologist*, 92: 34) was prompted to write, "It has been suggested that it has been there for a very long time and it has escaped detection from search until the present time. The consensus of opinion among British lepidopterists, however, is that it is a recent arrival." Writing from first hand knowledge of the species Wightman (1959, *Entomologist*, 92: 76) gave sound reasons why the insect could well have lived here for years without discovery. There never had been a consensus of opinion that *leautieri* was a recent arrival, but instead a naive fixation amongst collectors generally that any species met with for the first time in Britain must necessarily have newly flown in. The fact that the moth may be extending its range in Britain does not equally argue its recent migration from the Gironde. If, on the other hand, *leautieri* were to be a long-standing inhabitant of Britain then it must have subsisted on juniper, because its only other, and more usual food is cypress, and no cypress is indigenous to Britain.

The most common cypress, *Cupressus macrocarpa* Hartw. ex Gord was introduced from California early last century and the bulk of south coast trees derive from about 50 years ago and cannot have provided the flowers required by *leautieri* until something like the past thirty years. *C. macrocarpa* was first introduced into Britain in 1838 but was used in widescale plantings only from about 1880. The early 1900's saw extensive plantings and most of the larger trees date from this period 1880-1920. Large old trees are today found along the southern English coastline from Cornwall to Kent and Essex, and they occur principally in ornamental groups or avenues, not as plantations. The tree grows well only near the sea for it is very subject to dieback in cold winters, and it produces flowers rather erratically. Lepidoptera that are dependent upon *C. macrocarpa* for food will have the same distribution as the tree, and in the case of *leautieri* this will be the older trees that bear flowers.

A full account of rearing the species from the egg is given by Kettlewell and Haggett (1957, *Entomologist*, 90: 285-294).

Kettlewell and Wightman have separately recorded the view that the moth rests normally by day not on the bark or fence palings, as is usual in the genus, but amongst cypress foliage, and Wightman (1959, *Entomologist*, 92: 76) tells how he found that moths came commonly to light from cypresses standing in a chicken-run, and why he believed the pupa to be spun up on the tree. An empty pupa and cocoon were indeed found on the bark of cypress by Goater and Lorimer. The only recorded instances of larvae being found wild appear to be of two larvae beaten by Mr. Lobb by means of a long pole from *C. macrocarpa* on the Isle of Wight (1961, *Ent. Rec.*, 73: 9) and again by Wakely in 1962. A fully grown larva was found by Sam Knill-Jones in July, 1963, crawling along a garden wall.

Larvae in captivity have been induced to eat juniper.

When discussing the larva (1957, *Entomologist*, 90: 287) I quoted Millière's comment on Dahl's opinion that the larva of *lapidea* could be

likened to that of *Cucullia abrotani* F. (*artemisiae* Hufn.) and that this had led Treitschke to place *lapidea* among the *Cucullias*. Boursin also referred to this same account (*Bull. Soc. Linn. Lyon.*, 2: 22), saying that the larva of true *lapidea* was still very little known and that if Dahl had indeed examined that species and not *leautieri* then that fact might explain Dahl's observation, but I think it probable that Dahl could have had either because both more closely resemble some of the *Cucullias* than the common lithophanid larva. This is not to suggest that *leautieri* is wrongly assigned to its present genus, but it is a good opportunity of stating how closely allied are the genera *Lithophane*, *Xylena* and *Cucullia*.

The larva of *lapidea* is now better known thanks to the work of Mr. Wiltshire and at a meeting of the South London Entomological and Natural History Society, 27.ix.62, Mr. Wiltshire showed colour transparencies of the larva of this species from Lebanon.

Description of the fifth (last) instar larva

Forty-three days old and seven days after the last moult. Length 36 mm. Plump, cylindrical, the segments swollen, much restricted at the divisions, the larva is soft and fleshy and easily injured, of even width with taper only at the very last segment, abdominal rings but slightly broader than the head and thorax. Colour a rich olive-green gently shading into yellow-green and touched with maroon on each ring on the dorsum; wrinkled and decidedly yellower beneath with a pair of crinkled dark green bands. Dorsal stripe broad, bold, clear white outlined in black, running continuously from the prothoracic plate to the edge of the anal plate, broadest at the segment divisions and narrowest at the centre of each ring, particularly on the thorax where constriction is extreme, and swollen on the twelfth ring to form, in association with the two white warts there, a crown-shaped figure followed by a fine white streak before the plate. Subdorsals a series of broad, distinct, incurved waved clear white patches edged in black, finely drawn out at each side and extended above to embrace the posterior trapezoidal wart, running from behind the head on to the anal plate where they become yellowish, yellowish also on the prothoracic plate and smeared with yellow at the centre of each abdominal patch. Spiracular bands white, much mottled with yellow at the centre of each ring, a continuous, crinkled, undulating band arched upwards posteriorly to each spiracle, broken at the eleventh segment to reappear as a pale stripe down the anal clasper. Adjacent to each upward sweep of the spiracular band, and surrounding the spiracle, is a patch of deep maroon on each of the abdominal rings with a corresponding but weaker patch present well below the band embracing a white wart.

A further pale line is present between the subdorsal blotches and the maroon patches, comprising a series of pale streaks. Below the spiraculars the skin is mottled with dark green, yellowish and maroon flecks on which the white warts stand boldly. All warts along the dorsum, tiny, black, placed on a pale base that is ringed again in black. Lateral warts white, a tiny hair from each wart. Head smooth, shining, with a

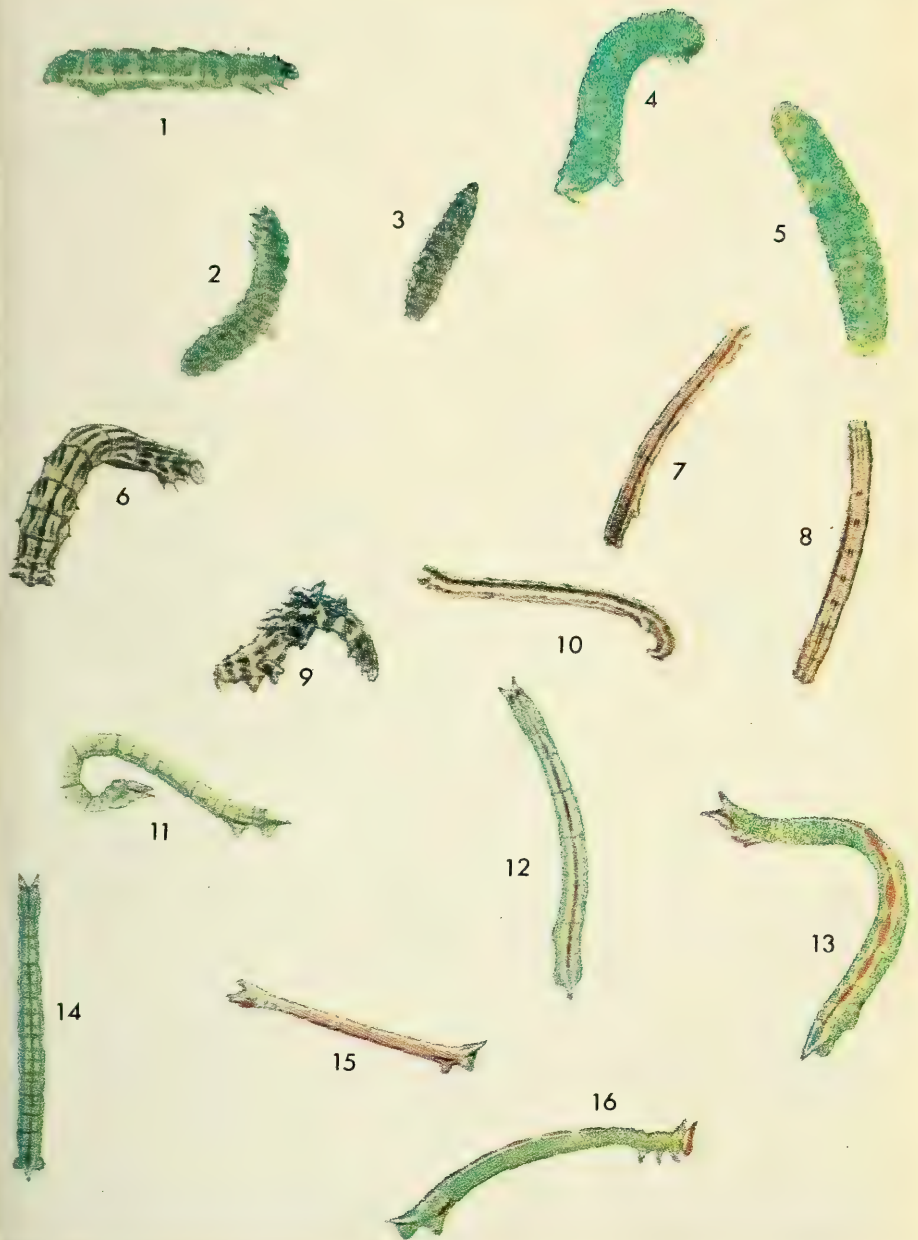
few weak hairs, flat in front, the suture weak, colour olive-green, the lobes much mottled on the upper half with pale flecks except for the two short dark vertical streaks; clypeus plain green outlined in whitish, labrum pale green, mandibles red-brown. The head well tucked into the first segment when at rest. True legs pale yellowish-green, ochreous at the tips, prolegs plain green, deep maroon at the extremities with pink crochets. Prothoracic plate bluish, soft, the dorsal stripe simply a tear-shaped flash of white at the anterior margin and extended most finely to meet the swollen stripe on the second segment, the subdorsals thick and continuous across the lower margin. Anal plate narrow, green, crossed only by the strongly marked yellowish subdorsals. Spiracles oval, orange, strongly edged with black, placed centrally on their segments, each immediately above the white band. There was a very little variation in this instar as in preceding stages. Some larvae were better marked with maroon along the posterior abdominal segments and others had minor breaks in the subdorsal stripe.

Figures: Plate IX fig. 1 newly hatched larva, figs. 2 and 3 third instar, figs. 4-6 fifth instar, 5.iv.1957 and 19.iv.1957. All *ab ovis* from Isle of Wight moths taken by H. B. D. KETTLEWELL. Reared on flowers and then foliage of *Cupressus macrocarpa*.

COLOBOCHYLA SALICALIS Schiff. THE LESSER BELLE

Until this century the Lesser Belle was one of the rarest of British moths and it still remained very uncommon until the end of the Second World War when Ham Street Woods in Kent were assiduously worked and the species was found there in large numbers; today these woods are still the only locality where collectors can be sure of finding the moth. It has only ever been recorded from south-eastern England, from Kent to the west Sussex border.

At Ham Street the moth frequents the more open parts of the woods and when plentiful it could be readily flushed by day from herbage and long grass. It was most numerous where thinning of the *Populus tremula* (aspen) groves had encouraged dense growth of suckers, and in such a situation in May, 1952, I found it remarkably abundant. This unprecedented abundance could be attributed to the cutting of aspens for replanting, during which abnormal quantities of young foliage became available, enabling the moth to exploit an artificial situation. The normal habit would seem to be to pass a precarious existence amongst aspens in the old oak woodlands of south-eastern England, utilising for food such young aspen shoots as grow naturally and in limited supply, for the older foliage of the upper crown of the tree is not acceptable to the larvae which instead require the juvenile leaves of suckers or saplings, and these remain attractive only for a few seasons. But WAKELY was successful in rearing larvae sleeved on willow (*Proc. S. Lond. ent. nat. Hist. Soc.*, 1958: 8) and FAIRCLOUGH has also found larvae easy to rear on this plant.



Figs. 1–5 *Aplasta ononaria* Fuessl.; figs. 6 and 9 *Thetidea smaragdaria* Fab ;
Figs. 7–8 and 10 *Scopula immorata* Linn.; figs. 11–16 *Thalera fimbrialis* Scop.

In captivity there have been several instances of second-brood moths emerging in August and September, and there is one record of a wild-taken moth on 14.ix.56 at Ham Street. The moth is usually out in late May to mid-June, but odd examples may be found in mid-July. Larvae have been found on aspen at Ham Street in late June and early July, 1953.

BARRETT (1900, *Lep. Brit. Isles*, 6: 283) gives a very good account of the habits and haunts of the moth, but his figure of the larva, Plate 261, is not accurate. The figures by HOFFMAN (1893, *Die Raupen der Gross-Schmetterlinge Europas*, Pl. 38) are good except for the exaggerated black spiracles. The figure given in the 1961 edition of South, *Moths Brit. Isles*, Series I, Pl. 148, is totally unlike *salicalis*. HEDGES (1950, *Entomologist*, 83: 97) has given an accurate account of the life history with an excellent photograph of the cocoons. The egg and beautifully patterned pupa are described and figured in *Ent. Gaz.*, 4: 267. The only mention in BUCKLER (9: 384) is the remarkable record of a parasite reared by BIGNELL.

I found that captive females could be kept alive for four weeks, feeding on sugar water, but the moths would quickly die if their container was allowed to dry out. The eggs hatched in ten days, the eggshell was not eaten but the cast skin of later moults was. The newly hatched larva was very active, and was coloured a greyish-ochreous with a dark purplish suffusion along the dorsum to the eighth abdominal segment, the head large and yellowish.

It became a uniform glassy grey-green after one day, with prominent black warts. It ate the hairy under surface of the young aspen leaf, leaving tiny perforations. The larva showed a thin dorsal line after its second moult but retained its grey-green colour until the next change. The larval stage lasted six to seven weeks and at all instars the many larvae I had under observation ignored older leaves for the tender young foliage. There are four moults in addition to the pupal.

Description of the fifth (last) instar larva

Measures to 30 mm. long at full growth, the body slender with abdominal rings 4 to 6 the largest, and with even taper to each end; viewed dorsally the larva is of uniform width. The large globular head is pale green and as broad as the first ring. Colour a bright yellow-green or sap-green, changing in intensity in relation to the amount of light cast upon the body, seen from above it may look deep blue-green, from the side a translucent yellow hue broken by dark green mottling, with conspicuous yellow intersegmental folds and with tracheal system showing yellow at the spiracles. The first thoracic and last abdominal rings are flattened and much wrinkled, the other rings being more smooth and firm. The only ornamentation is a fine dark blue-green dorsal line which is present on all segments, but weaker on the thorax and through which the dorsal vessel can be seen. True legs pale brown, prolegs pale green tipped with brown and placed well to the rear of the segment, the anal claspers long and slender. There are only two pairs of well

developed prolegs, those of the third abdominal ring being reduced to small conical non-functional appendages, and those of the fourth are small and weak but are used. Skin soft, smooth, the spiracles tiny, pale, thickly ringed with orange; the body hairs fine and soft, more numerous on the head and last ring. The larva moves and sits like a looper; it is a very active, nervous creature and when alarmed it can wriggle most violently.

Figures: Plate X figs. 11-13, all last instar, on aspen. *Ab ovis*, the parent moth from Ham Street. Figured 23.v.1952.

HYPENA ROSTRALIS L. BUTTONED SNOUT

PORRITT gives an adequate account of the larva in the last of Buckler's volumes (9: 1); Buckler himself evidently left no figures. There is a good description given by BARRETT (1900, *Lep. Brit. Isles*, 6: 318) but the figure plate 263 is poor.

The species seems to be present wherever there is plenty of hop in Britain, which is mainly in the southern half of England, but the moth has been recorded from as far north as Rhum in the Hebrides. It is apparently absent from Ireland.

Figures: Plate X figs. 5-8, all last instar, on hop, Pulborough, Sussex, from A. J. WIGHTMAN. Figured 18.vii.1953.

APLASTA ONONARIA Fuess. REST-HARROW MOTH

As a British insect this species really dates from 1937, when A. M. MORLEY found it in the Warren at Folkestone; during the last century there had been specimens recorded also from the Warren in 1867, 1869 and 1871, with one from Folkestone in 1877; but no more until 1909 (New Forest), 1923 (southern England) and 1932 and 1934 (both Romney Marsh). The Warren colonies prospered throughout the 1939-45 War, and by 1947 the moth had been found in numbers at Sandwich; it has continued to flourish in both these localities and there have been single records also from Tilgate Forest (1947), Southsea (Portsmouth) (1959) and Dungeness (1957 and 1959). The early history of the moth at Folkestone has been recorded in detail by MORLEY (1937-48 *Entomologist*, 71: 145; 72: 81; 74: 138; 78: 190; 80: 168 and 81: 179) with notes on the life history and the discovery of the wild larva. More recently (*Ent. Rec.*, 80 (1968), 9, suppl. (2)) CHALMERS-HUNT has given a full history of both Kent colonies.

MORLEY and COCKAYNE recorded that the larva hibernates in its fourth instar, remaining dormant from August until May, and passing one further moult. Moths emerge during the latter part of June and throughout July, with second brood moths coming out from mid-August into early September. Larvae have been found after hibernation from 4th May until 4th June. The larva feeds only on *Ononis*.

I have found the larva to be very sluggish and to move but little in the wild state, so that it could be located by its feeding habit and its frass, both of which occur at the tip of the leafy shoots; it has the characteristic habit of biting partly through the stem of a young shoot about an inch below the tip so that the end droops and withers. In captivity it was necessary to well water both plant and larvae. Although the penultimate instar may be much paler green than the foodplant, at full growth the larva is beautifully matched to the soft deep green of *Ononis*. The larva likes to sit just below the tip of a shoot where it is partially hidden by the bunched leaflets. Larvae quickly fall when the plant is disturbed, but they may be sought tightly curled at the base of the plant.

Description of last instar larva

COCKAYNE (1938, *Entomologist*, **71**: 169) has given a very full description of the early instars, remarking that this larva was structurally quite unlike any other geometrid larva that he had seen. The larva is remarkable for the peculiar structure and arrangement of the hairs which are of two forms, long curved setae or shorter blunt-tipped hairs, which Cockayne called cup-hairs, the latter being borne sometimes on bold conical projections or bosses, and sometimes on the skin itself.

Length to 17 mm. when fully grown. Shape thickset and obese, stubby, with little taper at each end. Rather flattened beneath, the rings but weakly differentiated from one another, but when the body is extended each ring is seen to be edged with a pronounced flange that is interrupted at the ring divisions. Colour a blue-green that is softened and lightened by a profusion of hairs and spines that arise both from tubercles and the skin. The skin is shining yellow-green like a chile pepper, but is so contorted by tubercles and by folding that highlights and shadow combine with hairs and spines to present a dulled mat surface in which only the larger yellow tubercles stand out, and these but slightly; this is especially true of the first pair of dorsal tubercles on each of the abdominal rings. There is a weak yellowish lateral line, which is merely the paler extremities of the skin flanges, and it can be traced from the thorax to the anal flap. The whole of the anal segment and the one preceding it are markedly yellow-green. There is a poorly marked dorsal stripe of dark green which runs the full length of the body. The larva is uniform paler green beneath and the hairs there are shorter and sparser. The two kinds of hairs are both present in the last instar, both are white, the shorter knobbed hairs arising from the cuticle and tubercles, the longer curved hairs only from the tubercular cushions.

Head longer than broad, flattened in front, pale green but varying in the amount of black freckling that may be so dense as to almost obscure the green. Prothoracic plate a horny, squared and smoothed part of the cuticle, studded with a row of tiny black tubercles at front and posterior edges, and carrying sparse long hairs directed forward over the head. Anal flap large, juicy yellow-green, fleshy, bluntly heart-shaped owing to the bilobed anterior edge, it carries only short hairs. True legs pale

green tipped with pink. Spiracles rounded, dark yellow. Prolegs dark green, anal claspers yellow-green like the flap.

This peculiar larva has no obvious affinities with any other of the Palaearctic region species. MEYRICK (1927, Revised Handbook of the British Lepidoptera) included it with those geometrid genera whose moths appear to have primitive venation to form the family *Monocteniadae*, but this has not proved very satisfactory and modern practice is to return *Aplasta* near to the Emeralds which share similar hindwing venation.

Figures: Plate III fig. 3, larva in hibernation; figs. 1, 2, in penultimate instar. Folkestone Warren, 16.v.1948. Figs. 4-5, last instar, Sandwich, 26.v.1963. On *Ononis repens* L.

THETIDEA SMARAGDARIA Fab. ESSEX EMERALD

The larva of this species had always been difficult to locate until Rev. BURROWS published his observations in 1900 *Ent. Rec.*, 2: 113, 152, 169, 171; and as the moth is rarely caught the species has since that time invariably been collected in the larval stage. It has always been extremely local in Britain, being confined to the Essex coastal salt marshes from Tilbury to St. Osyth, and across the Thames estuary at Sheppey in Kent, where Chalmers-Hunt tells me it was last recorded in 1957.

Rev. Burrows related how the larva can survive submergence by sea tide, how the debris is attached to the body and how the body hooks change in structure from the first instar to the barbed spiny warts of the last skin. He discussed how the many larvae he had reared never ate *Achillea* or *Poterium*, only *Artemisia maritima*, but in captivity the larva did well on *A. absinthium* and the cultivated Southernwood: he also tried *Pyrethrum* and *Anthemis* without success but found that larvae eagerly devoured *Tanacetum*: some larvae were found wild in his garden on *Santolina*. He recorded that one should never beat for the larva, always search because it drops before the tray can be got into the foodplant, a habit shared by *A. ononaria* and some other Emeralds. His hints on collecting are a model for all field workers to heed, thus: "When you reach the hunting-ground, first of all roll on the patch of plant, then sit down and eat your lunch, or smoke a pipe. When you are ready, go quickly and have another look. If the day be warm, the sun shining, you will see the larva walking about quite actively on the beaten down patch."

Burrows gave very detailed descriptions of egg and larva with special reference to the means by which particles of foodplant are attached to the larva, and his notes are well illustrated by line drawings. Other authors who figure the larva, such as Barrett, South and Stokoe, so heavily obscure the larva with its camouflage that the figures are of little value.

Description of last instar larva

At full growth the larva measures 30 mm. The basic colour is ochreous-grey but upon this are superimposed darker striations. There is a solid dark mediodorsal stripe running continuously from the third ring

to the last that is finely margined in pale grey. The subdorsal lines are narrow and white and rather inconspicuous and are bowed upwards at the centre of each ring and thus appear to curve away from the dorsal stripe at the ring divisions., they are also rather constricted at the centre of the ring. The subdorsals are flanked immediately below by a broad dark brown band. There are two prominent blackish lateral streaks below the subdorsal on rings 5-10. Low down on the sides of rings 4-9 there runs a fine white line and on rings 8-9 this line curls towards the medioventral stripe. The ventral surface is much paler than above, and carries a series of V shaped ochreous markings on rings 4-8, each figure surrounding a central black spot.

The disposition of the spiracles is unusual in that those on rings 5-8 are placed very high upon the sides, close to the subdorsal line. All spiracles are large and black. Claspers are ochreous striped vertically with dark brown, true legs mottled brown, slender but large for size of larva. Head pale grey striped with four dark lines.

A feature of the larva is the series of warts armed with short spikes and arranged along the sides, and to which particles of foodplant are attached. In shape the larva tapers gradually from the small head and thorax to its broadest at the fifth abdominal ring.

Figures: Plate III figs. 6, 9, both last instar, on *Artemisia maritima*, Canvey Island, 18.v.1950.

THALERA FIMBRIALIS Scop. SUSSEX EMERALD

Also known as the Notched Emerald, this is another of those species with a few records scattered over many years until at length it was found to be breeding in at least part of the range from which it had earlier been reported; there is a gap of 34 years between CAPPER'S famous Beachy Head capture in 1902 and RUSSELL'S Swanage specimen (1936), and another ten years before the Bournemouth and Bradwell-on-Sea moths (1946). The Dungeness and Dengemarsh records date from 1950 but the populations may well have been established a few years earlier as the numbers caught there in subsequent years seem to indicate. Three moths were taken at Eastbourne in 1950, 1953 and 1956, but only in the Dungeness area has the moth been regularly taken, and there it had become less plentiful by 1960. In 1963 DE WORMS observed that it was 'equally plentiful' on the Crumbles at Eastbourne (1963, *Ent. Gaz.*, 14: 118).

The moth has been caught during the latter part of July and the first half of August, but in 1952 there were June emergences. The larva hibernates in its third instar, from late September until March and pupates during June. KETTLEWELL (1953, *Ent. Rec.*, 65: 305) records how he collected larvae before hibernation in August and again after hibernation in early June. Goodson has since found that the easiest way to find the full-grown larva was first to brush the foodplants and then search for the curled up larva on the ground below.

In the wild state the larva has been found on *Achillea millefolium* (Yarrow) and has been bred from the egg on it in captivity. In 1953

HUGH ROBINSON succeeded in forcing through a second brood by giving heat from the egg stage; the larva does not seem amenable to forcing once the hibernation is entered.

The egg and early larval instars are described by CHALMERS-HUNT (1952, *Ent. Rec.*, **64**: 10) and MORLEY and YODEN (1952, *Ent. Gaz.*, **3**: 193). Descriptions of the larva and the pupa are given in the *Ent. Rec.*, **65**: 307 and the *Ent. Gaz.*, **5**: 95. The following is from my original work.

Description of fifth (last) instar larva

Length to 31 mm. Colour a delicate pale yellow-green along the dorsum, bright apple green laterally and darker beneath with a pale ventral line edged darkly; the lateral shading converges towards the dorsal line on the thoracic segments which are somewhat swollen and contracted. Dorsal line narrow, dark green on thorax, quickly becoming maroon along the abdomen, ending abruptly at the anal flap in a broad spear-shaped flash of blue-green; the dorsal line suffused on the abdominal rings to form a series of broadly oval pink blotches with a fine purplish central stripe, the streak on the seventh ring being shortened. Anal flap acutely pointed and tipped with pink. Head pale greyish, deeply notched to form unusually long horns which are coloured dark red at the tips, a dark brown stripe up each side. Thoracic legs edged and tipped with pink, also the horns of the first segment. Claspers deep green. Spiracles tiny, yellow. Low down along the lateral fold of the seventh abdominal ring there is a short bright maroon streak. Intersegmental folds pale yellow. In shape broadest and flatter at the posterior abdominal rings, with an acute lateral flange, tapering to cylindrical constricted thoracic rings, and small head.

COCKAYNE (1953, *Ent. Rec.*, **65**: 307) described a form in which the dorsal stripe was dark green instead of red, but with the same red horns, legs and lateral streak.

The larva has been compared with *Chlorissa viridata* L., but the later instars also show resemblance to *Hemistola immaculata* Thunb. (*chrysoprasaria* Esp.) in size, structure and in the presence of the single maroon streak laterally on the seventh abdominal ring. *C. viridata* also has a series of short red dorsal streaks which are thickened at the ring divisions, but the extended red dorsal pattern and pronounced horns of *T. fimbrialis* easily distinguish it from other British Emerald larvae.

Figures: Plate III fig. 15, third instar 3.iii.1953; figs. 11, 14, fourth instar 4.iv.1953; figs. 12, 13, 16, fifth (last) instar 19 and 26.iv.1953. Reared on Yarrow ex Dungeness female taken by J. M. CHALMERS-HUNT, 1953.

SCOPULA IMMORATA L. LEWES WAVE

There are numerous instances amongst the British lepidopterous fauna of species of remarkably restricted occurrence although their foodplants do not appear to be unusually scarce or their habits particularly demand-

ing. The Lewes Wave is probably the most astonishing of them all, because since its proper recognition in 1887 it has never been found in Britain outside its Lewes home which is comprised of a few acres of grass-heath of a type that outwardly would seem to be little different from other such sites not only in southeastern England but in neighbouring parts of Sussex. The species has a fairly wide distribution in Europe where the habitat is heathland and meadows, and where it may be double-brooded. The factors that have restricted the species to this one locality in Britain—at least in modern historical times—would appear to be the ecological site complex rather than food, for while the larva has not been discovered wild here, it has been found abroad on thyme and marjoram (Prout in SEITZ, 4: 35) and reared on *Salvia*, and in this country it has been successfully reared on knotgrass and plantain; *Calluna* has been freely quoted as a foodplant but no one knows on what evidence except perhaps that the plant grows where the moth flies!

The status of this Sussex habitat is sadly one of decline despite the concern shown by the Protection Committee of the Royal Entomological Society and other interested persons: the balance within the plant communities seems to have undergone a marked change during the past twenty years although the trend was evident before then: the greatest change was brought about by cultivation during 1939-45, possibly for the first time in modern historical time. In recent years the small area reserved for the species, through the kindness of the owner, had become much overgrown with bracken and thorn-birch scrub, and the adjoining land, while suitable for the insect now, has been afforested and will eventually carry a coniferous plantation. The reserve was extended in 1964 by the Sussex Naturalists' Trust who now manage the area and who have carried out much clearing of scrub in the attempt to recreate site conditions of former times.

The moth has been thought to have become extinct in Britain on more than one occasion since the Second World War, but nevertheless odd examples have continued to appear.

H. J. TURNER'S description of the larva given in BARRETT (*Lep. Brit. Is.*, 8: 50) appears to be the only fully recorded account and this has been variously repeated by succeeding authors. The following is my own account.

Description of last instar larva

The fully grown larva measures to 22 mm. long. The build is typical of the long, slender and wiry larva of *Scopula* which is more regularly cylindrical than *Sterrhæ*, and its general colour is a pinky ochreous along the back and sides, paler beneath. The skin roughened and wrinkled especially at the thorax and again at the lateral abdominal rings. The dorsal pattern consists of a pair of faint brown lines which run from behind the head through to the last segment where they converge on the anal flap; the lines are bolder on the thorax and become deeply etched black on the abdomen from its seventh ring, and also at the intersegmental divisions between rings 3-4, 4-5, 5-6 and 6-7, the lines are thickened to

appear as twin black dots, the first pair being rather fainter. The subdorsal stripe is broad and blackish brown and also runs the full length of the body, being a little broader at the swollen flanges of the thorax and again at the later abdominal rings; the stripe is divisible into two, with the bolder, thicker line above, and the division is clearly evident on the abdominal rings. There is a weak dusky-grey subspiracular line low down on the sides. On the ventral surface there is a short streak at the centre of each of the abdominal rings 2-5 with additional sinuous lines on the fifth and sixth. The pale prolegs and anal claspers are edged in front by irregular dusky lines and the sides of their segments are similarly adorned. Spiracles small, round, black, placed centrally but high up the side of their segment and very close to the lower edge of the subdorsal stripe. Head rounded, pale ochreous with double brown bar above at the centre and a black patch to each side, sparsely studded with short pale bristles like the body. Thoracic legs long, thin and grey-ochreous.

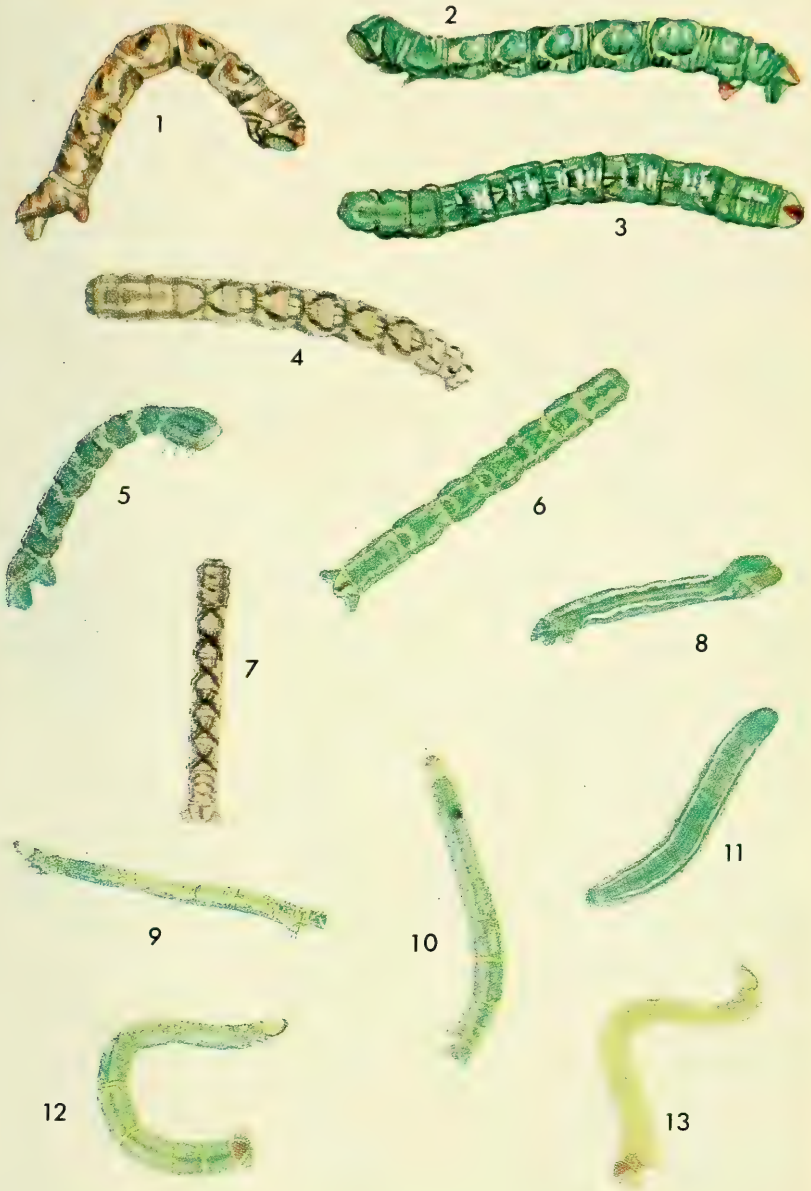
Figures: Plate III figs. 7, 8, 10 all last instar, Lewes, Sussex, reared on *Polygonum* (Knotgrass), *ab ovis*, by R. PARFITT. Figured 20.ix.1946.

COSYMBIA PUPPILLARIA Hübn. BLAIR'S MOCHA

The popular name of this moth derives from the first British specimen which was a female caught by Dr. BLAIR at Freshwater, Isle of Wight, on 2.x.1946, and from which several offspring were reared. Since then there have been records of less than thirty moths, all in southern England, in an area from Kent to Devon, with Hockley (Essex), Chalfont St. Peter (Bucks) and Weston-Super-Mare (Somerset) the most northerly occurrences except for one at Wroxham (Norfolk). There have been two early summer records—Hockley 23.v.1959 and Leigh (Surrey) 16.vi.1964—all other occurrences have been during August, September and October. In nine years there were none seen, in 1956 there were eleven, in 1959 there were five, and four in 1964.

The majority of specimens in British collections are progeny of one female moth caught in the Scilly Isles (Tresco) on 20.v.1957 by ROBIN MERE, which were inbred from several generations. Apart from the Scilly Isles, the status of the species in Britain must be regarded as migratory, and within the Scillies the moth is still rather uncommon but there is evidence that it has been resident for many years (RICHARDSON and MERE, *Ent. Gaz.*, 9 (1958): 120). COCKAYNE discussed the two last-century Scillies moths in 1947 (*Ent. Rec.*, 59: 55). The moth appears to occur equally sporadically in Denmark and is unknown in Belgium, in France it is a southern species with a distribution that is mainly Mediterranean.

The species is clearly on the very edge of its northern range in Britain and the key to its survival here may be in the manner in which it passes the winter. Millièrè (1859-74 *Iconographie*, 3: 197) states that the larva can be found throughout the year in central France but that during December and January its growth was slowed. The only insects



Figs. 1-7 *Eupithecia phoeniceata* Ramb.;
Figs. 8 and 11 *Eupithecia intricata* Zett ssp. *hibernica* Mere;
Figs. 9-10 and 12-13 *Eupithecia egenaria* H.-S.

that were brought through a British winter as pupae were those recorded by Haggett and Mere (*Ent. Gaz.*, **10** (1959): 45), and these did not pupate until January and February, producing moths in the following May: these writers suggested that diapause in this species might be determined early in the larval life as a delicate balance between instar and condition of food whereby as long as fresh food was available there would be no diapause but as the leaf chlorophyll content changed during autumn so the larval metabolism became modified to allow feeding to continue on tougher, older foliage at lower temperatures. The prolonged larval life would then last until late winter and the ensuing pupa remain dormant until spring. It seemed significant that inbred pupae formed during autumn always produced moths immediately and when kept at low temperatures the pupae died.

It was found that larvae reared in Britain would eat the soft young leaves of several species of oak including *Q. suber* L. (Cork Oak), *Q. Lucombeana* Sweet (Luccombe Oak) and *Q. robur* L. (Common Oak) but larvae were most successfully but larvae were most successfully reared on *Quercus ilex* L. (Evergreen Oak). MILLIERE (*ibid*) also gives *Cistus*, *Myrtus*, *Phillyrea* and *Arbutus*, and other continental writers have quoted privet and hornbeam. People who tried to feed Scilly Isles larvae on *Myrtus* were unsuccessful but Blair reared his larvae on that food.

Descriptions of the life history and of the pupa are given with illustrations by HAGGETT, *Ent. Gaz.*, **9** (1958): 103.

Description of the fifth (final) instar larva

Measures to 22 mm. long when fully grown.

There are only two forms of the larva at full growth, a bright emerald green that varies to darker olive green, and a dull umbrous brown. For a short while after the fourth moult those larvae later to assume the green skin exhibit much variation in colour from soft, greyish green and yellow green to ultramarine and bluish but they quickly become a uniform bright green. The brown larvae also begin the last instar much brighter than at maturity.

In both forms the dorsal pattern is very reduced being discernible in the green larvae only at the anterior margins of the abdominal rings but is rather better developed in the brown. The basic markings of both forms remain constant at maturity, being a delicate pair of whitish lines along the dorsum, composed of tiny whitish or cream dots, the lines converging at the segmental divisions where they are bolder, and again before the second pair of dorsal tubercles. The entire skin surface is scattered with a profusion of tiny whitish or cream flecks and dots that break up the uniform ground colour which is darker above than ventrally. A pale dorsal stripe is present only on the thorax, with darker shading to each side of it that merges with the head banding. A fine crinkly lateral line of white or cream runs from the first abdominal segment on to the anal claspers.

The head appears ginger brown owing to dense short bands of freckling and it is streaked with two pale vertical bands like a clove.

True legs pale reddish brown, prolegs tipped with pinkish, and anal claspers whitish and heavily streaked in front and behind with deep reddish brown.

Spiracles tiny rounded ovals, ringed with black and barely discernible from the tiny black tubercles which carry a single short soft hair. The spiracles rather larger on the prothorax and again on the sixth to eighth abdominal rings, all placed centrally but high above the lateral line.

The shape is of the rather thick *Cosymbia* type with little taper at either end and with the rounded head that is flattened in front.

In its earlier instars the larva of *C. pupillaria* rather resembles that of *C. pendularia*, but at full growth it is in both forms so similar to the same stage of *C. portata* that I am quite unable to distinguish them: *C. pupillaria* is rather the larger. Amongst the large numbers of larvae I have reared there were very few that remained brown in the last instar.

Figures: Plate V figs. 1-8; fig. 8, first instar one day old; fig. 1, second instar; fig. 3, fourth instar; fig. 6, fifth instar newly moulted; fig. 2, 4, 5, 7, fifth instar fully grown, 3.viii.1957. All from female moth caught by Robin Mere Tresco, Scilly Isles and reared on *Quercus ilex* (Holm Oak).

ANAITIS EFFORMATA Guenée. SHORT-CLASPED TREBLE BAR

DE WORMS wrote of this moth (1951, *Ent. Gaz.*, 2: 3, 157), "It was only in 1923 that Dr. K. JORDAN (*Novit. Zool.*, 30: 243) showed that what had hitherto been considered a form of *A. plagiata* was a distinct species under the name of *A. efformata*. Later, in 1934, PROUT finally admitted it as a new species into the supplement of Seitz *Palaearctic Geometridae*, p. 87. Both insects often fly together and at the same periods in May and August in southern England. The range of *A. efformata* does not appear to extend further north than the Midlands, whereas *A. plagiata* is found freely in the Highlands."

In *Journ. am. ent. Soc.*, 5 (38): 26 (1941), COCKAYNE stated, "*A. plagiata* is found all over England and in most parts of Scotland, *efformata* is not found west of Dorset nor north of the Midlands." In Ireland only *A. plagiata* is found.

Here we have two species that look alike, occupy the same ground over part of their ranges, and have coincident flight and mating periods; yet their genital structures are very distinct and there would seem to be a breeding barrier that keeps the two insects specifically separated. However, A. V. HEDGES recorded (1949, *Proc. S. Lond. ent. nat. Hist. Soc.*, 1947-8: 78) that where the species occurred together in the Chilterns *A. efformata* was on the wing at least ten days before *A. plagiata*. Presumably *A. plagiata* has been in Britain the longer, *A. efformata* being a more recent arrival that has not been able to occupy the higher and wetter land.

COCKAYNE (*loc. cit.*) observed "the larva is exactly like that of *plagiata* in shape and distribution of pigment, and the anal plate is

truncated in the same way, but the colour is drab instead of red-brown. It feeds on St. John's Wort (*Hypericum*) but I have not found it on *H. pulchrum* which is a favourite food of *plagiata* in moorland districts." I can see no difference between larvae of the two species, both have dull umbreous forms and both can be brightly marked and display deep brick-red or rosy or orange colours, and both may have dark patterns. They are equally variable when reared from the egg.

I found that larvae of *A. efformata* did not eat *Hypericum* flowers, but they liked both young and mature foliage; in autumn they would eat yellowing leaves without ill-effect. I have found the wild larva in spring, in April, sitting at night on the dead stems of the previous year, and in the last skin. I found that moths will lay eggs freely only in the withered seed-heads and not upon leaves or green stems.

Description of last instar

Measures to 34 mm. long at full growth. Thickset with first five abdominal rings longer than broad, other rings much broader than long, very little taper at the head, rather more on last three abdominal rings, each ring with a conspicuous lateral flange, interrupted at the intersegmental areas. The body very flattened dorso-ventrally. Thorax much wrinkled transversely and each of the first five abdominal rings has the posterior half deeply wrinkled, while on the rest of the abdomen there is heavy lateral skin folding.

The appearance of the larva is dominated by the sharp contrast in colour above and below the lateral flange, and the paler posterior abdominal rings. The very variable general colour is some shade of dull buff, stone, flesh-pink, sienna or chocolate, darkest at the thorax and anterior abdomen, and pallid at the fifth abdominal ring; each ring is suffused rosy, sienna or smoky. There is a fine dark medio-dorsal line that is continuous from head to first abdominal ring, thereafter it appears only as a short dark streak at the beginning of each ring, then as a larger and bolder streak at the centre and finally as a short thick blotch at the very posterior edge of the ring; the line is continuous again from the fifth abdominal ring to the anal flap. At the beginning of each of the abdominal rings two to five the dorsal central streak is contained within a small blue-grey lozenge which is more robust in the dark brown form, while in some examples the parallel sides of the lozenge are extended to frame the medio-dorsal in a pair of fine lines, the thorax always has these lines clearly expressed. There is a narrow stripe of pale ground colour before the next line which takes the form of a dark greyish sub-dorsal band and it is continuous to the last ring but much weaker on the fifth abdominal.

The skin is paler at the sides, the lateral flange is bright primrose or whitish. Immediately below this the skin is deep dark brown rapidly becoming paler and assuming a lilac-grey or pinky-brown colour until the broad pale central band along the centre of which there runs a blanched centre stripe, and there are two conspicuous white tubercles to each side of every abdominal ring.

The intersegmental areas are smoky-grey or tinged cobalt and the posterior dorsal margin of fifth, sixth and seventh abdominal ring is marked with a tiny black streak where the centre and inner lines meet it.

Spiracles broadly oval, pale brown with darker centres, placed centrally but high up on the side of the abdominal ring, those of the eighth being the only pair visible from the dorsal aspect. Head large, globular, pale brown, smooth and flattened in front, brown mottling in two short bands above and a further band to each side, each band consisting of regular V-shapes placed in a vertical series. Ocelli black and mouthparts dark brown. True legs pinky-brown. Prolegs and anal claspers prettily ornamented with a dark stripe down the side. Anal flap broadly triangular, ending squarely and bluntly, shaded dark brown with pale rim, dark central band with a series of dark dots to each side that form a cup-shaped figure; the flap is set with strong short bristles at its posterior edge.

Dorsal tubercles show up in the darker examples as four pale spots. The tubercles each support a minute hair.

Figures: Plate VI figs. 1-5 all last instar, reared from Arundel, Sussex, female, on *Hypericum perforatum* L., 9.xi.1963 and 12.vii.1964.

LAMPROPTERYX OTREGIATA Metcalfe. DEVON CARPET

During the 25 years that followed METCALFE'S description of this new species (1917, *Entomologist*, **50**: 53) little was known of its existence outside Devonshire although it was recorded from several localities within that county. More recent years, however, brought a spate of discoveries and the distribution in Britain today is known to extend from the north Wales counties of Caernarvonshire, Montgomeryshire, Merioneth to Carmarthenshire; and from Gloucester, Somerset and Cornwall to south Hampshire. BARRETT (1893, *Lep. Brit. Isles*, **8**: pl. 359, fig. 11) figured an example as *suffumata* from Pembroke, as COCKAYNE (1936, *Entomologist*, **69**: 245) and HUGGINS (1963, *Ent. Rec.*, **75**: 218) have both pointed out.

Although Cockayne gave a very full account of the larva and life-history (1936, *loc cit.*) and MERA had reared it 19 years earlier, the early stages remained little known to collectors and the moth itself was still an elusive quarry to most of them until recent years. In 1962 Comdr. HARPER found the moth to be very common in the New Forest, Hants. a discovery that not only confirmed Dr. KING'S solitary record of 1952, but which enabled many people to observe the moth and rear it from the egg. In the following year A. H. DOBSON published his comprehensive observations on the species in a Devonshire habitat, including discovery in the wild of the egg and young larva (1963, *Ent. Rec.*, **75**: 162 and 216 with plate).

This double-brooded insect is now known to have a much longer flight period for each of its broods: Dobson recorded it from 18th May to 29th June and 8th August to 14th September, and I found that moths kept in damp tins would live for 20 days after capture but would quickly



Figs. 1-8 *Cosymbia pupillaria* Hübner; figs. 9-12 and 14 *Xanthorhoe biriviata* Borkh.;
Figs. 13 and 15 *Poecilopsis lapponaria* Boisd.

die if kept in a dry box. DIXON and EDWARDS told me that at Dawlish they used to find the moth out during the second week of May.

Cockayne reared his larvae on *Galium aparine* L. in 1933 after Mera had had limited success with *G. saxatile* L. One natural foodplant is *G. palustre* L., the Marsh Bedstraw, as Dobson found in Devon and my success with New Forest larvae has amply confirmed; the larvae (200) that I reared fed entirely on the leaves, ignoring a profusion of flowers and flower buds, but BRETHERTON reared some on *G. saxatile* and these fed at first on the blossom (1963, *Ent. Rec.*, **75**: 218). The natural food in the New Forest would seem to be *G. uliginosum* L., Fen Bedstraw.

Enlarged line drawings of the larvae were given by Cockayne in 1936 and the very fully grown larva was illustrated photographically by Dobson in 1963.

The description of the larva given by Cockayne is extremely detailed and especially discusses at great length the pattern in relation to the tubercles which are given a terminology not in common use amongst field workers; because of this I give an edited version of Cockayne's account.

Description of last instar larva

The fully grown larva measures 18 mm. long. The skin is very thin and the contents of the abdomen show through. Head rather longer than broad, whitish, with a brown-grey tint, and flecked with darker brown; a broad dark brown stripe to each side, clypeus pure china white. True legs almost colourless, tinged with ochreous. On the thorax is a pure white stripe and external to it is a narrow line little paler than the ground colour, with yet another similar line beyond. Between the dorsal stripe and the subdorsal lines the ground colour is snuff-brown and external to the subdorsal it is tawny-olive. Towards the posterior of each of the first five abdominal segments there is a conspicuous white dot, expanding posteriorly to give rise to two parallel lines which diverge and converge again on the first subsegment of the succeeding ring to form a circle and then to continue across as parallel lines again. Just behind the white dot an oblique white line arises on each side and is continued across the first two subsegments of the succeeding ring. The snuff-brown colour becomes intensified around the white dot and outside the oblique white lines to form a dark brown V mark which is a dominant feature of the whole pattern. The posterior abdominal segments are conspicuously paler, a dark brown dorsal stripe runs down all of them and is bordered on each side by a white line, then a band freckled with brown. The palest parts of the ground colour, those of the venter and sides, the dorsum of the sixth abdominal and the whole of the seventh, eighth, ninth and tenth are cinnamon-brown or Brussels brown. The intersegmental folds of the abdomen are orange. Elsewhere the larva inclines to sienna and even vandyke, the darker colours being along the dorsum of the first five abdominal segments.

The anal plate is cinnamon-brown with a white margin and ends bluntly. The spiracles are black with a small white centre and lie in a

broad whitish spiracular stripe that is broken by bands of the ground colour at the posterior half of each segment. Beneath there is a central brown stripe bordered by a cream stripe of the same width, then a broader olive-green band and finally a cream stripe to each side broken at the centre of each ring. The outer aspect of the first proleg is dark red-brown or blackish, and it is always striped with white in front; the anal proleg is tawny-olive with a bold white stripe down the side.

The most important feature of the larva is the colour of the large conical tubercles, those on the dorsum and sides of the 4th and 5th abdominal rings are especially large and black, as are the single lateral tubercles of the following ring, but the dorsals of that ring are very small and inconspicuous as are those of all succeeding rings.

There was no perceptible variation amongst the 200 larvae I reared.

Figures: Plate X figs. 1-4, all last instar, reared on Marsh Bedstraw, *Galium palustre* L., *ab. ovis* New Forest females, figured 3.vii.1963.

XANTHORHOE BIRIVIATA Borkh. BALSAM CARPET

This moth provides another instance of a species discovered only in very recent times to be resident but attached to a host plant that has been introduced years ago from America; on the Continent the foodplant is *Impatiens noli-me-tangere* L. which in Britain is confined to the Lake District and north Wales; in this country the food is *Impatiens capensis* Meerburgh (*fulva* Nutt) which has been here since early last century and which has formed large colonies in the Thames valley and along other waterways of south-east England. The moth was first found in Middlesex in 1955 and during the next few years was discovered in Bucks and Surrey; the only locality from which the moth has been reported well away from the Home Counties is south Hants., where Bernard Skinner found it in 1964. BRETHERTON has interesting observations on this species (*Proc. S. Lond. ent. nat. His. Soc.* 1965 : 22) saying that unsuccessful search had been made in north-west Surrey before the moth had been found in Britain and yet by 1956 and 1957 there were strong colonies, and that these were present in localities in 1964 that had been searched earlier. DE WORMS also contributes a useful note *Ent. Gaz.*, 14 (1963) 105.

The moth *Epirrhoe alternata* has had the name *biriviata* as one of its synonyms and records of this name as a British insect before 1950 always refers to *E. alternata*.

The discovery of this moth in Britain is well written up by MINNION and GOODBAN *Ent. Gaz.*, 7 (1956), 3 and 8, 190 with photographs and descriptions of the life history. A descriptive note on the larva and pupa was given by HAGGETT, *Ent. Gaz.*, 8 (1957), 167, and is repeated below. Larvae have been found wild by Minnion and Goodban and by WAKELY; when young they were mainly along the ribs on the undersides of leaves and low down on the plant, but during the last instar larvae were found openly on the upper leaf surfaces and often at the midrib. No larvae were found on plants growing in open situations without shade. Larvae

appeared to eat only a portion of each leaf and the Balsam assumed a ragged appearance where larvae were plentiful in the wild. They fed mainly at night. The moth is active in sunshine and emerges from the pupa during the early morning, it pairs and lays eggs in bright sunlight. The moth has one main brood, emerging at any time from the last two weeks of April until the end of August but in captivity the great majority come out in May. Second brood moths have been bred in captivity but few in number, and only occasionally have these approximated to the darker form *aestiva* Fuchs: but examples of *aestiva* have been found wild. It has been recorded by different observers that pupae from either generation may overwinter with the moths fully formed within and the wing pattern quite visible.

The wild food in Britain is unquestionably *Impatiens capensis* and in captivity larvae feed up rapidly upon it. Larvae that I reared out of doors in 1956 took an average of 23 days from egg to pupa, those kept indoors but not forced in any way took an average of 18 days, some being as quick as 13 days, the longest 20 days. I tried larvae on the red and pink flowering cultivated Balsams but neither were eaten: Minnion and Goodban tried larvae on *I. parviflora* but were uncertain whether poor results were due to food or method of rearing.

Description of the last instar larva

The largest larvae at full growth measure 26 mm. long. They are of the characteristic *Xanthorhoe* shape and pattern; the head is small and just less in width than the first segment; the second and third thoracic segments are slightly swollen and puckered laterally, the abdominal segments are of regular cylindrical shape, longer than broad, and gently constricted at the intersegmental divisions, the segments increasing in girth but slightly from the thoracic.

The general pattern is based on a fine dorsal line that is extended into a small black dash at the beginning of each of the 2-6 abdominal rings and followed by a longer streak at the centre of each of those rings. This system is outlined by a fine pale line and is then bound to the spiracular line by a broad band of darker shading broken only by a fine pale subdorsal line with immediately below it a less distinct pale wavy irroration. There is sharp contrast between the lateral dark shading above the spiracular line and the much paler colouring below which is relieved only by the faintest mottling of ochreous or orange. Beneath, the larva has a broad pale central band narrowly divided by a fine dark line, and a double set of loosely drawn bands to each side which meet at the intersegmental areas to form a series of open chain, each link marked by a dark dot. The division between the darker dorsal and paler ventral colouring is sharpened by the strong development of a freckled blackish spiracular band on the thoracic segments and again on the last abdominal where the stripe runs the length of the anal claspers and prolegs; at both ends of the stripe there is below it a dusting of white. True legs pale brown, prolegs of sixth abdominal segment blackish in marked contrast to the pale ventral shading. Head small, rounded,

flattened in front with well developed lobes much freckled with black, the dots forming a darker streak to each side that joins with the spiracular band of the prothorax. Thoracic plate of the common Geometrid type, weakly expressed and ill defined; and flap ochreous and well studded with black hairs. The body and head are set with sparse but sturdy bristles, those on the body placed on a tiny white tubercle.

There is much variation. In its simplest guise the dorsal dots and dashes stand starkly and unrelieved on a plain ground colour, at the extreme development of the dark brown forms the posterior dorsal streak becomes extended by dark suffusion to occupy so much of the dorsum that only the set of anterior dots stand on a pale patch. The commonest form of the last instar larva has a dusky brown suffusion above the spiracular line with a darker blotch at the centre of the dorsum of each abdominal segment. The black truncated dash at the beginning of each abdominal segment is isolated in a pale fawn triangle with the long axis directed on the posterior part of the preceding segment. The black streaks of the dorsal line on the latter abdominal rings are not conspicuous but the pale lateral lines are very distinct. A form with similar dusky markings and pattern to the common brown type, but a bright green ground colour is rare. Another distinctive but infrequent variety is a plain pale brown form spectacularly ornamented by sharply etched black dashes and blotches of the dorsal pattern and the black freckling in the spiracular region of the thoracic and latter abdominal rings and dark clasper streaking which persist in all forms.

Variation of the fully grown larva of *X. biriviata* can be likened to that of other British *Xanthorhoe* species and in particular to that of *X. fluctuata*.

During its early life the larva is a plain glassy blueish green and it is in the penultimate instar that there is a great variety of pattern and colour. This mostly vanishes again at the next moult and in the last instar the majority are of the dark brown form described above. At this variable phase there is every intermediate shade in colouration from a soft pale yellow-green through olive and blue-green to grey-brown and red-brown; each colour form may bear a weak and simple pattern or it may be heavily suffused by dark mottling and one of the prettiest forms is that which combines the palest green with the heaviest black dorsal pattern. The green forms are decorated with lemon-yellow at the intersegmental folds and ventrally, the brown and greyish forms with orange and pink.

Figures: Plate V fig. 14 eleven days old, second instar; figs. 9, 10, 11, 12 seventeen days old, last instar. Reared on *Impatiens capensis* from eggs sent me by E. W. CLASSEY. All figured 26.vi.1956.

THERA VARIATA Schiff. GREY SPRUCE CARPET

Since PROUT first described this insect as a distinct species in 1921 there have been several accounts of the larva and the species' habits given by British writers, most notably by COCKAYNE (1926, *Ent Rec.*, **38**: 33).



Figs. 1-5 *Anaitis efformata* Guen.; figs. 6-10 *Perizoma minorata* Treits.

by TAMS and COCKAYNE (1941), *Amateur Ent.*, 5 (38): 14 and 27), by DE WORMS (1953, *Ent. Gaz.*, 2: 157) and more recently by FLETCHER (1953, *Ent. Gaz.*, 4: 228 and 1961, *Moths Brit. Isles*). From abroad an early and significant contribution to knowledge of the larva was made by LAVALLEE (1923, *Bull. Soc. ent. Fr.*, 1922: 308).

Today the species is known to be widely spread over southern England from Kent to north-west Devon where it is particularly plentiful, with stations also in Suffolk, Shropshire, Gloucestershire, Herefordshire and Cornwall. It occurs in central and north Wales and Prof. Heslop Harrison has recorded it from the Isles of Lesser Skye. It is also known from Mull and Inverness-shire, and in 1966 at Glen Brittle Forest, Skye, there were more examples of the s.sp. *variata* than s.sp. *britannica* (Forestry Commission records). ROBIN MERE records the occurrence at Kenmare, Co. Kerry, of the continental sub-species *variata* (1964, *Ent. Gaz.*, 15: 67) and remarks that the same form was known from Westport, Co. Mayo, also that the species was known to Baynes to occur in north-eastern Ireland. BAYNES (1964, *Revised Cat. Irish Macrolepidoptera*) adds Co. Dublin and says most of the moths have been determined as typical *variata* and not sub-species *britannica* Turner.

Writing of the distinct British race of *variata* which TURNER named *britannica*, Dr. COCKAYNE (1926 *loc cit.*) says the difference "cannot have developed quickly and proves in a most conclusive way that the species has been established here for a long time." As the food of *variata* is confined to conifers that are not native to Britain it is instructive to see how long these trees have been available (data from Jackson, 1946, *Identification of Conifers*)—Norway Spruce has been present since 1548 and the Silver Fir, *Abies pectinata* D.C., from about 1603 but the remainder of our commoner exotics were introduced during the last century; thus *Abies nobilis* (D. Don.) Lindl. 1830, *Picea sitchensis* (Bong) Carr. (Sitka Spruce) 1831, *Abies grandis* (Dougl.) Lindl. 1832 and *Abies nordmanniana* 1848. With the exception therefore of Norway Spruce and *Abies pectinata* there was no food available to *variata* until the last century, and even those two earliest introductions were represented by specimen plantings rather than plantations. Even allowing that *variata* subsisted in Britain on this limited supply of food, it is still extremely unlikely that 400 years is sufficient for a population to evolve racial characters. Although populations in the west of England and in Wales may be comprised entirely of sub-species *britannica*, I find as many typical *variata* at Arundel, Sussex, and at Alice Holt Forest, Hants, as *britannica*, and the typical form occurs elsewhere in south-east England; this could suggest later arrival of typical insects now interbreeding with, and artificially introduced into, the older established race.

Although BEIRNE (1948, *Proc. R. ent. Soc. Lond.*, 23: 316 and 361) argues that this insect survived, along with spruce, on land now submerged off south-west England, and that it had earlier occupied Britain while spruce flourished during the first interstadial of the Ice Ages, he does not account for its survival during the long period afterwards when spruce

was absent, and when the only conifers present were juniper, yew and pine, none of which I could induce the larva to eat.

One thing is certain, that the large-scale planting since 1920 of both spruces, but especially the Sitka, and also of Douglas Fir, is a major cause of the wide distribution and local abundance of *T. variata* in Britain today.

The moth flies in May and June and again in the autumn with moths emerging in the wild well into November. I found that when sleeved out of doors from eggs laid in May the resulting larvae fed up at very different speeds, producing moths from the end of July until October. It is principally a dweller in spruce and Douglas Fir plantations and it exists also amongst shrubberies and park conifers, but it is not a pine wood insect.

Foodplants

T. obeliscata Hübn. is principally a pine feeder, but it will eat spruce and Silver Fir; at Hazelborough Forest, Northants., *obeliscata* inhabits Norway Spruce plantations, and I found two larvae on *Cupressus macrocarpa* Gord. in south Cornwall in December, 1964.

T. variata is primarily a spruce feeder but it will eat Silver Fir, it likes Douglas Fir and also exists on Larch; but it has never been found on pine, nor can it be induced to eat pine in captivity. I found it would not take Yew, or *Cupressus* or *Thuja* at any instar.

Description of the last instar

Length to 20 mm. Ground colour a deep grassy-green, broken by a broad paler blue-green stripe along the centre of the dorsum and another laterally, each stripe narrowly bisected by a fine dark line. Spiracular line dark green followed by a rather paler green band and then a narrow yellow line, crinkled along the lateral folds, marked bolder on the thorax and again above the claspers. Ventrally there is a single pale yellow line. Spiracles very small except those on the prothorax, orange and oval. Head large, globular, green with crimson mouthparts, the head tucked well into the thorax when at rest. Thoracic legs usually greenish, claspers deep green. Anal flap deep green edged yellowish, anal twin prongs short and stubby. The skin smooth and waxy, much creased transversely.

In his paper Cockayne (*loc. cit.*) considered that both *obeliscata* and *variata* larvae varied much in later instars in the depth of ground colour and in the clarity and whiteness of the lateral stripe and he wrote, "In the majority of the *variata* larvae in the last instar the thin ventral line is a clearer yellow than in *obeliscata*, in which it is white or whitish-yellow; between the spiracular and subspiracular line there is a very distinct white line in *obeliscata* which in *variata* is scarcely visible. The green ground colour is lighter below the spiracles than above in *obeliscata* but this contrast is absent in *variata*. These differences are not constant but on the whole the *variata* are less brightly marked. In the penultimate instar . . . the legs of *variata* larvae remained green and those of *obeliscata* became pink, and in the last instar the deep pink legs of *obeliscata* contrasted still more clearly with the green ones of *variata*." But I have found that wild collected larvae of *variata* may have the thoracic legs so

well tinged with pink, and especially at the tips, that they could easily pass for *obeliscata*; this is particularly true of the Alice Holt, Hants, colonies which inhabit spruce and Douglas Fir. In these larvae the deep yellow subspiracular stripe is the surer criterion.

Cockayne found that "any larva with only five setae on each side of the anal flap is *variata* and any with seven is *obeliscata*, and that six may occur in either species but less commonly."

The following are the principle differences between larvae of *variata* and *obeliscata*, being a tabled summary of Prout (in Seitz, 1912, *Palae-arctic Geometrae*) and Cockayne (1941, *Amateur Ent.*, 5 (38): 41).

<i>obeliscata</i>	<i>variata</i>
1. Thoracic legs pink.	Legs usually greenish.
2. Subspiracular stripe ivory white.	Stripe deep yellow.
3. Lateral bands bold, sharply white.	Bands inconspicuous, dull bluish.
4. Slender streaks join spiracles.	No such marks present.
5. Anal points longer, .7 to .8 mm.	Points short, .3 to .4 mm.
6. Six or seven setae on each side of anal flap.	Five or six setae on each side of flap.

Figures: Plate X figs 9 and 10, both last instar, Alice Holt Forest, Hants, 11.viii.1953, on *Picea sitchensis* (Bong.) Carr. Sitka Spruce).

EUPHYIA LUCTUATA Schiff. WHITE BANDED CARPET

Apart from two early records from Essex and Kent, this species dates as a British insect only from 1950 when it was first found at Ham Street, Kent, and after its press notice it was revealed that a pair of moths had been taken at Uckfield, Sussex, also in 1950 and only 12 days later. The moth was subsequently found, sometimes commonly, at Ham Street, Folkestone, Ashford and in other woods of east Kent, and also in mid and east Sussex. Several taken at Methwold, Norfolk, in 1966.

The moth has been caught in May, June and August and in captivity moths have emerged indoors in September, December and January. The larva has been found wild in July and September; but the species has an erratic timetable, the eggs hatching sometimes in as little as three days and in others as long as three weeks. Pupae from the first brood frequently lie dormant until the following May. I found a high rate of inviability in eggs from both wild-taken and inbred females, and it is well recorded that the female may pair more than once. Wild moths have perhaps been seen by day more often than at night for they are easily flushed out of herbage and they appear to fly of their own accord during sunshine and particularly in the early evening; they have been found at rest on tree trunks and they have come to light after dark.

From moths taken in 1953 I made an unsuccessful enquiry into the mechanism that controls colour in the last larval instar; during the next two years I tried to establish broods wholly of green or of brown larvae, but all I could discover was that from one-third to one-quarter of the

progeny were always brown larvae irrespective of the parent or environment and that this frequency was constant in both early and late broods.

The larva is said abroad to feed on bedstraw, but all British-bred insects have been reared on willow-herb and wild larvae have been found upon that plant. The plant most usually associated with *luctuata* is *Chamaenerion angustifolium* (L.) Scop., but in captivity *Epilobium tetragonum* L. and *E. montanum* L. are accepted.

The life-history is described (1952, *Ent. Gaz.*, **3**: 27) but the description of the fully grown larva is poor and the following account should be substituted; the figures given in that paper were of the pre-pupal larva and are rather different from the normal. Further references are *Ent. Gaz.*, **4**: 163 and **5**: 41).

Description of the last instar larva

At full growth measures to 27 mm. long. A long and slender larva, tapering at the thoracic segments to a flattened head that is held forward when at rest. Flanges of the thorax a little swollen. There are two distinct forms, a commoner green one and an orange-brown one that is etched with open diamonds along the back.

The green larva is yellowish along the dorsum and bounded by a wavy subdorsal line, and bisected by a dark blue-green narrow dorsal stripe that is more heavily marked on the thorax and again on the posterior abdominal rings; but which is broken at each of the centres of the middle abdominal rings of the palest examples although continuous in the stronger marked ones. On each of the abdominal rings there are converging concave green arcs that flank the dorsal line and are suffused towards it. Below the pale subdorsals there is a sequence of first dark green, then pale and finally another dark green band of about equal width, the last placed immediately above the spiracles. Below the larva is a deeper sap-green and marked on the ventral surface by three pale and widely set lines.

Intersegmental folds a conspicuous bright yellow at the middle abdominal rings. Head flattened, with a few hairs, plain ochreous-grey as are the thoracic legs, the claspers green and the anal pair marked by a vertical pale streak. Spiracles small, round, orange.

In the brown form all the indefinite markings of the green larva are accentuated in blackish-brown but with considerable variation in intensity, while the ground colour itself ranges from a pale yellow-brown to a deep orange with rusty shades. Along the dorsum the concave markings are strengthened to form etched latticed diamonds beginning on the first abdominal ring and continuing to the seventh, the first and last—being on shorter rings—are much truncated; the diamonds are crossed by intersegmental folds of bright orange. In the better marked examples the rear half of the diamond (i.e., that part situated on the anterior half of the next ring) is formed of thicker streaks. On the sides the diamonds are joined by an irregular dark brown blotch to a lateral band that is composed of three separate fine wavy freckled strands. Lower down on the sides is another dark blotch placed between each pair of abdominal



Figs. 1-6 *Hadena conspersa* Schiff.; figs 7 and 9-10 *Diarsia florida* Schmidt.;
Figs. 8 and 11-12 *Hadena compta* Schiff.

rings. The pale subdorsals are interrupted between the rings. Spiracles small and black. Head and thoracic legs pale grey-brown with sharp darker freckling. Claspers brown, the anal pair streaked very clearly in white and flanked by the dark brown lateral band.

Figures: Plate IX figs. 7-11, all last instar, reared on *Epilobium tetragonum* L. *ab. ovis* from Ham Street females, figured 6.vi.1954.

PERIZOMA MINORATA Tr. s.sp. *ERICETATA* Steph.
HEATH RIVULET

Until recently little was recorded of this Rivulet from Ireland, although it had for long been known as a locally common resident of heaths and moors of northern England, Scotland, Orkneys and Hebrides. On a visit to the Burren district of Co. Clare, Eire, in early August, 1963, I found the moth to be widespread and in profusion amongst large rocks by the sea, the moths sitting on the rocks in sunshine and when disturbed they flew off in little clouds. ROBIN MERE found the moth still on the wing there during the second week of September.

Females that I caught in the Burren packed their tiny eggs well down into the dense fresh flowering heads of *Euphrasia*; the newly-hatched larvae were orange colour and after the first moult they had a pale-yellow body and black head, looking like a minute copy of the full-grown larva of *P. albulata*; at this stage they also had large blackish prothoracic and anal plates. From the time they were half grown the larvae would bore into a seed capsule and remain outstretched and so motionless that a quantity of black frass accumulated. Mostly, however, they remained totally hidden and it is remarkable that the fattening larva can conceal itself in so small a capsule. During the last instar they would sit about quite openly upon the plant, but they were always beautifully camouflaged. The larva is best reared on the growing plant and can be readily located by standing the plant upon a sheet of white paper when daily examination will reveal frass beneath each tenanted pod. One larva reached full growth within four weeks, the others took a further week; the dumpy yellow pupa was formed in a tightly spun cocoon of leaf litter.

BUTCHER (1961) *Illustrations of British Flora* II, 263, describes two species of *Euphrasia*, the Burren and Irish one being *E. salisburgensis* and this is the food of Irish *minorata*; in Scotland and N. England the larva feeds on one form of the common Eyebright *E. officinalis*.

During the early part of September, 1963, Robin Mere collected a large amount of *Euphrasia* in the Burren district and gave it into my care upon his return; by September 30th I had recovered over fifty larvae of *P. minorata* in all instars, some still newly hatched.

Description of last instar larva

Measures to 10 mm. in length: it has the familiar spindle shape of *Perizoma* larvae but is even more squat than usual, having short, fat segments that are much broader than long and deep skin folds between them.

The larva is very variable and colour variation can be divided into two groups, brown and green.

The general colour of the brown form is a sandy-orange flecked with deeper orange at the skin folds and paler, almost primrose yellow, at the sides and weakly grey beneath. The pattern consists of a very fine and continuous dorsal line placed on a broad dorsal band of ground colour that is margined by a bold purple-brown subdorsal stripe present on all segments except the prothoracic and interrupted at the anterior tubercle on each of the subdorsal rings, sometimes marked heavier at the inter-segmental sometimes broken there, but always appearing to be continuous when the larva is not stretched. In the lateral space of ground colour there is first a fine continuous grey line then a broad wavy band of clear orange edged below by primrose yellow in sharp contrast to the sinuous subspiracular stripe of dark maroon further below; all markings are intensified on the posterior abdominal rings for these are the only parts exposed by the larva when it bores into its seed capsule and they are in consequence well camouflaged. The tubercles are black and tiny, each surrounded by a ring of pale yellow, and supporting a short fine bristle. Head and thoracic legs greyish, mottled with dark brown, the head small and rather pointed; prothoracic plate well chitinated, pale greyish flecked with black sometimes in the form of two rings, anal flap pale yellow marked with a dark central stripe. Anal claspers large, red-brown, proleg yellowish. Spiracles black, centred with white, but so minute as to appear exactly like the black tubercles adjacent to them, and they are also set within a pale ring. The brown larva can look very like *P. bifaciata*.

The green form is commonly a yellow-green with no lateral markings between the fine dusky line that accompanies the subdorsal and the spiracles. The subspiracular stripe is a dulled green and is not conspicuous. The subdorsal lines are as well marked as in the brown form and between them the dorsal area is flushed a warm orange, with the tubercles again placed on paler bases. The black lateral tubercles show up very clearly. The colours of the posterior abdominal segments are suffused with chocolate and maroon.

The exact hue of the body changes with age, growing paler and more waxy as the larva grows older and fatter: variation in the brown form includes copper and even crimson suffused examples and while the green form is more constant there is a handsome and not infrequent variety that is a darker cooking-apple-green and which has the subspiracular line deep maroon. Some larvae immediately after the last moult were plain weak yellow with grey-green stripes and lines but these soon became brown.

Both forms of *minorata* were easy to separate from the larva of *P. blandiata* of which there were a few in the *Euphrasia* collected by Robin Mere; *blandiata* in addition to being larger at full growth has better defined markings, the dorsal space being filled with deep purple-red and constricted on each segment (as is well shown in Buckler's accurate figures—Vol. 8. Pl. 127, fig 6) and accompanied by bold lateral lines: it is a more slender and better proportioned larva than the dumpy *minorata*.

Figures: Plate VI all figs. of last instar larvae; 6-8 ex-female Ballynalacken, Co. Clare, reared on *Euphrasia officinalis*, figured 31.viii.1963; 9 and 10 from wild collected *E. salisburgensis*, from ROBIN MERE, Ballynalacken, figured 21.ix.1963.

EUPITHECIA VIRGAUREATA Dbdy. GOLDEN ROD PUG and
EUPITHECIA SATYRATA Hübn. SATYR PUG

Although larvae of both of these species are illustrated by Buckler, neither set of figures is accurate and while well drawn they both appear to be *Eupithecia absinthiata* Clerck. Both species feed on common plants that are also eaten by other *Eupithecia* larvae.

Eupithecia virgaureata Dbdy.

The larva of *virgaureata* has been poorly portrayed in all those works that I have been able to consult; thus DIETZE'S enlarged drawings, Plate 56 fig. 2, show a heavily marked *absinthiata* as does JUUL, Plate III fig. 12, while the illustration in Barrett IX, Plate 387 fig. 3a, although after BUCKLER, is grotesque, and those of Wilson, Plate 25 figs. 3, 3a. are much too indefinite as are those of more recent publications. The figure given by SPULER, Plate NT 7 fig. 49 is exceedingly poor as indeed are most of his Geometer larvae.

So I am giving a set of original figures of this species in this work.

The larva of *virgaureata* has an appearance and colouring that is shared by several common *Eupithecia* species and as some of these also feed on the flowers of wild Golden Rod (*Solidago*), and as they are mostly more plentiful, there has been plenty of scope for confusion. Moths of *virgaureata* are usually obtained by collectors by the bulk-rearing of larvae swept or gathered indiscriminately from Golden Rod in the autumn; they are usually reared with *absinthiata*, *expallidata*, and *satyrata*, also *castigata* but this last named has a very different larva to the other four. It is doubtless because of its typically *Eupithecia* diamond pattern that the first brood larva of *virgaureata* is so rarely observed and the foodplants in the wild are nearly unknown at that time of year: it is unlikely that second brood larvae exist wholly on flowers of Golden Rod and allied *Compositae* because they are so uncommon in contrast to the hordes of *absinthiata* and *expallidata* found with them in Southern England.

L. B. PROUT gave a valuable and searching summary on this species as long ago as 1907 (*Entom.*, 40: 210 and 220) and nothing more seems to have been added in the years since. Prout questioned some of the foodplants recorded for *virgaureata*—Sallow, *Lychnis*, *Calluna*—and was satisfied only with Crewe's brood reared on *Anthriscus* flowers and continental evidence of blackthorn and whitethorn.

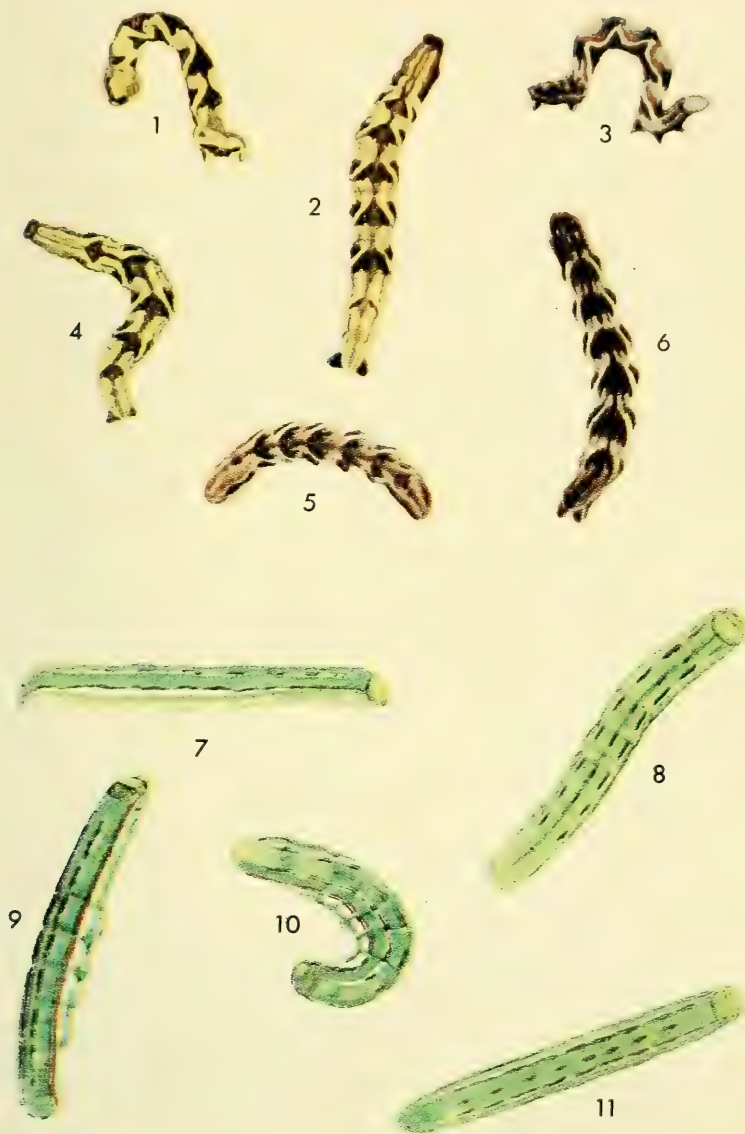
I spent some years searching for this larva and collected a wide selection of flower heads during the autumn, but was only ever able to obtain larvae from *Solidago* and these at the very low frequency in Kent and Sussex of one *virgaureata* to about one hundred *expallidata*: in

western Ireland its frequency was not much higher amongst *absinthiata*, say, two larvae per bag of flower heads but other larvae were scarcer. From a number of Kent pupae that resulted from larvae collected in 1961 I reared moths the following April and obtained many larvae from pairings, progeny hatching during May and pupating by mid-June. They fed at first on hawthorn leaves, preferring those leaves that were lying flattened together, and they ignored flowers of hawthorn, *Spiraea*, *Anthriscus* and leaves of *Prunus*: when they reached last instar they showed a decided preference for petals of hawthorn blossom. Moths emerged in August and I again made pairings and tried again to rear larvae on hawthorn and other foliage but they all died. A few pupae had lain over and produced moths the following spring. These fed up on hawthorn leaves and again I tried their offspring on the same food later that summer but once more they died.

The pupa can be very distinctive, indeed quite different in appearance from any other British *Eupithecia* pupa and it was because of this that I was first able to identify and isolate *virgaureata* from other *Solidago* insects. It has been well described by CREWE and quoted by BARRETT IX, 76, and is beautifully illustrated by Dietze and Juul. But this well-known form of the pupa with dark streaked wing cases and mottled thorax is by no means the only one: of 153 pupae that I had in 1962 from spring pairings only two were of this form, all the rest being quite unmarked and like any other *Eupithecia*

Description of last instar larva

Measures to 20 mm. long, a slender larva slightly flattened on the abdomen, the thorax cylindrical, the body tapering from the head to the abdominal rings 3-5 but these rings still longer than broad. Each ring has that knobbly appearance on the sides that is so common in *Eupithecia* and which is due to skin folding and puckering around the spiracles. The mediodorsal stripe is discernible only on the thorax and consists there of a fine pale line edged in dark brown which swells and becomes successively larger on each ring to form a distinct elongated diamond on the third. On each of the first six abdominal rings the dorsal stripe is suffused into a darker dorsal patch that is composed of twin dark brown arms and which take the form more of a cloven hoof than the diamond or lozenge pattern that is so common in *Eupithecia*, but this species does share the characteristic short peak or streak at the anterior part of the ring that is extended forward from the patch and so links each dorsal patch from one ring to the next. These dorsal patches in *virgaureata* were most frequently of the rounded cloven-hoof shape in the majority of larvae I have seen but in some larvae the patches were sharply edged to form diamonds. Each arm of the patch is extended posteriorly as a fine sinuous dark brown subdorsal streak which swells into a large brown patch laterally and then joins with the dull grey-brown colour beneath each ring. The dorsal and lateral patches are separated by an angled clear yellow or whitish streak that converges on the dorsum to comprise a series of conspicuous chevrons on the first five abdominal rings. There



Figs. 1-6 *Eupithecia virgaureata* Dbdy.; figs 7-11 *Aporophyla luneburgensis* Frey.

is an ill-formed but deeply marked lozenge on the sixth ring but the remaining rings, which are exceedingly narrow, are weakly marked on the dorsum but have a better defined dark brown subdorsal band. The sides of the thorax and last three abdominal rings are mottled brown becoming much paler at the sides so that a pale line is apparent contrasting with the darker shading below.

Ventrally there is a fine strong central dark line set on a pale band that runs the full length of the abdomen and from the last pair of thoracic legs to between the claspers of the seventh abdominal ring.

Head rounded, slightly longer than broad, flattened in front, the epicranial suture deep and the lobes sharply cleft above. True legs pale brown, claspers brown or grey-brown, the anal pair with dark vertical streaks. Anal plate with a dark central streak. Skin soft, dorsal warts paler on the dark patches, each with a short stiff bristle.

The ground colour is exceedingly variable in shades of yellow, light brown, reddish-brown and grey-brown but I am not aware of any green form. The dorsal patches can be deep rich purple-brown, velvety-black or dark chocolate and the associated chevrons clear white, primrose or pale brown. The chevrons may link to form a striking wavy line.

The yellow larvae with sharply etched brown diamonds are so similar to larvae of *E. tripunctaria* that it is extremely difficult to tell them apart, but the subtly curved edge of the chevron and broader diamond will distinguish *tripunctaria* and this also appears to feed solely on *Angelica*. The deeply marked horseshoe pattern appears to occur only in *virgaureata*. Larvae of the very variable *E. absinthiata* can have dark brown dorsal patches accompanied by bright yellow stitches and chevrons but the angled dorsal streaks that comprise the dorsal patch are usually not joined at the mediodorsal line and the peak effect is absent.

Figures: Plate VIII figs. 1-6 all last instar on hawthorn leaves, inbred ex Lyminge, Kent, 5.vi.1962.

Eupithecia Satyrata Hübn.

(Not figured in this work)

The larvae is much better known and is accurately illustrated by Dietze and Juul. Buckler's figure 4a plate 131 is the best of a poor set and is the same figure given by Barrett. The significance of *satyrata* is that it only superficially resembles the common *absinthiata* pattern, and instead it shares the same slender cylindrical body and coarser roughened skin of *castigata* and *vulgata*, and shares also the dorsal pattern of those two species, having open diamonds along the dorsum with prominent intersegmental transverse streaks. But *satyrata*, being always some shade of green or yellow-green, produces ill-marked examples in which only the anterior half of each diamond is present and these may be confused with *absinthiata*. I have also known this weakly marked form mistaken for *E. centaureata*.

References

- Barrett, 1897, *Lep. Brit. Is.* IX.
Dietze, 1913, *Biolog. Eupith.*

Juul, 1948, *Nordens Eupithecier*.

Prout, 1907, *Entom.*, **40**: 210, 220.

Spuler, 1910, *Raupen der Schmetterlinge Europas*.

Wilson, 1880, *Larvae Brit. Lep.*

EUPITHECIA PHOENICEATA Rambur. CYPRESS PUG

This is another species discovered in Britain in very recent times and which has taken to a foodplant that is not indigenous, and indeed has itself been introduced on a substantial scale only during the last 50 years. The Mediterranean Cypress (*Cupressus sempervirens* L.), which with Juniper forms the larval food in the western Mediterranean, is in Britain an uncommon tree, found only in ornamental plantings; the Monterey Cypress (*Cupressus macrocarpa* Martw. ex Gord.) from California, has been planted along the south coast of England and is very plentiful in the West Country (see also notes under *Lithophane leautieri* Bois. in this work).

The moth was first taken at Penzance in 1959 by DE WORMS and MESSENGER (1960, *Entomologist*, **93**: 93) and subsequently found by AUSTIN RICHARDSON to be numerous in stations on the Lizard peninsula (1963, *Ent. Rec.*, **75**: 65). In 1962 and 1963 I beat a quantity of larvae from *C. macrocarpa* on the Lizard. Since 1960 the species has been reported from Minehead (Somerset), Swanage (Dorset) and Maidencombe (Devon), and Dobson and Kennard have found the moth at Torquay sitting on trunks and branches of Cypress. Descriptive summaries have been written by MERE (1961, *Proc. S. Lond. ent. nat. Hist. Soc.*, **1960**: 66), FLETCHER (1963, *Coridon*, (B) **4**: 4) and DE WORMS (1963, *Ent. Gaz.*, **14**: 107), and notes on the moth's occurrence in Jersey have appeared (1965, 1966, *Ent. Gaz.*, **16**: 18, **17**: 147).

Habits of the larva

I have found that larvae were to be beaten only from the older, denser foliage of mature trees and not at all from the young succulent growth of small bushes or hedges.

I noted that in captivity the larvae rarely strayed from Cypress foliage until they were fully grown and beginning to shorten. The procrypsis was among the most successful of all caterpillars, with green and brown forms simulating their environment to an astonishing degree. Only when the larva was fattening during its final instar could it be found, even when on a small sprig of Cypress, because at that stage it was proportionately thicker for its length than the Cypress. In the green larva the bright red splash of colour on the pale anal flap gave an extraordinary close illusion of the blotched leaf-scale of Cypress or the open end of a broken shoot.

The larvae were at all instars quite avid feeders eating only the buds at the shoot extremities of mature foliage; the result in captivity is that they quickly exhaust their food, even although there remains plenty of

green foliage. I had one larva eat Lawson's Cypress (*Chamaecyparis lawsoniana* Parlatores) in captivity when in the last instar.

In 1962 I obtained 38 larvae during the period 27th-29th November; 27 were green and 11 brown, six were in the third instar, 14 in the fourth instar and the rest in their last skin. In 1963 I again worked during 27th-28th November and obtained 20 larvae of which two were in the penultimate instar and the rest full grown, and most were of the green form. Most larvae of both years had spun up by the end of December, only the odd larva continued to feed into January. Some cocoons that I opened during February contained unchanged larvae, but these had pupated by the first week of March; they had been stored in temperatures of 35-40° Fahrenheit.

Description of fifth (last) instar larva

Length to 20 mm., body thickset, with the first two abdominal rings rather more slender, and the first five abdominal rings each clearly divisible into three sections, the centre one a little swollen, especially at the sides, to form fleshy flanges; the skin with heavy transverse folding and the intersegmental folds very conspicuous. Thoracic rings humped with the head at rest tucked well beneath. A stubby larva with a knotted appearance, the skin devoid of all but the sparsest and shortest hair, the skin shining and waxy. Anal claspers large and fleshy.

There are two forms, one deep grassy green, the other mottled pale brown.

The green form has a dulled thorax with a darker blotch at the centre of the dorsum of each ring, and darker again laterally where it is relieved by large irregularly shaped cream blotches, especially on the first ring. The abdominal rings show a pattern of chequered green and pale yellow, dappled with pale bluish-white; the pale yellow ground colour is present on the first section of the ring only at the sides, where it merges into a bluish blotch that opens into a pale yellow ring, which in turn encircles the fleshy green central section. Dorsally the first section shows as a deep green patch, the anterior part of which is occupied by a neat, squared, pale blue spot. The central section shows dorsally a \cap -shaped figure of dark green outside of which lies a pair of dark green longitudinal streaks, these broaden and open at the beginning of the posterior section, which itself carries a central dark green patch at its posterior edge. There is a fine dark blue-black dorsal line from the first abdominal ring to the last, anal, ring but it is prominent only where it meets the pale blue patch on the anterior section of each ring. The head is olive-green, the lobes outlined finely in black and sometimes with blackish freckling at the sides, the clypeus shaded black where it joins the deep epicranial suture; mouth-parts carmine-red; there are short hairs in front. Ventrally the larva is a plain olive-green, and there is a clear white central line broken at the centre of each ring where it forms a little ring to enclose a green spot, and has a pair white streaks extended upwards to join the lateral pale blotch. True legs olive-grey tipped with pink, prolegs a carmine-pink with whitish folds above, those on sixth abdominal ring much smaller than

anal claspers; anal claspers dark green and glassy with a pale stripe in front, large and strong, the anal flap cream or white tinged with pale green, and a central wedge of deep bright carmine centred in black. Spiracles minute, not at all evident to the naked eye, orange, situated on the abdomen at the centre of the swollen lateral cushion.

The green larva may be brightly variegated or very dulled, and the individual colour components of pattern may vary in their intensity and extent.

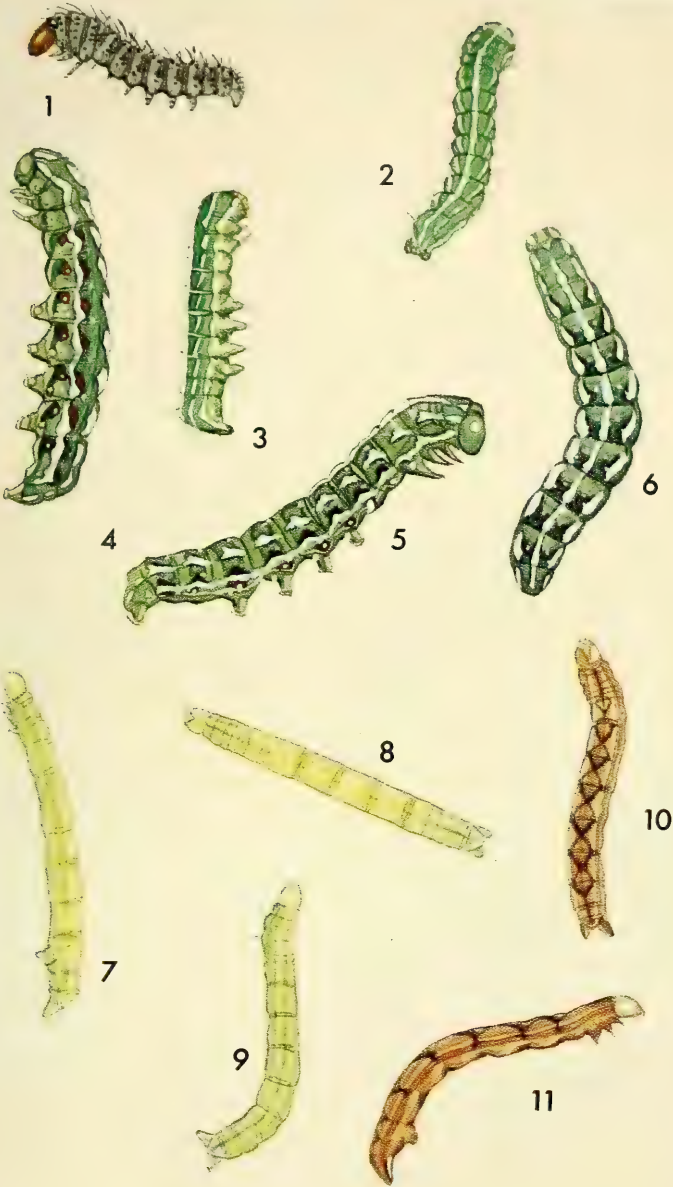
The brown form is basically putty coloured and mottled with blue-white markings as the green form, but with additional dark brown markings in bold relief that give greater variegation. Dorsally each abdominal ring one to five bears a chevron of dark brown, each arm comprised of twin streaks placed closely together, the outer pair being extended rather further behind the first which at the anterior end stands astride the dark dorsal stripe. Beneath, each ring is marked as the green form, but is dulled dark brown and the upswept streak from the central ring forms a bold dark wedge on the side of the ring. Laterally the pale circle that surrounds the swollen cushion on the mid-section is shaded smoky brown. The intersegmental folds are prettily tinged a bright orange, as also is the horny edge to the prothorax behind the head. At full growth the brown larva may acquire a greenish tinge. Head grey with sharp dark brown freckling above. true legs grey, tinged with warm brown, prolegs soft pink, anal claspers greyish with pinky-white stripe, anal flap pinky-white with dark brown streak.

Both forms of the larva are brilliant examples of procrypsis; the green simulates most closely the swollen leaf scales of Cypress, the brown exactly matches the dead Cypress twiglets, in both forms the variegated markings serve to break up the body line and deceive the eye of any predator.

Figures: Plate IV, figs. 1-4 last instar; figs. 5, 6 third instar; fig. 7 fourth instar immediately after moult. On *Cupressus macrocarpa* Hartw. ex Gord., south Cornwall, 30.xi.62 and 9.xii.62.

EUPITHECIA INTRICATA Zett. subsp. *HIBERNICA* Mere

This subspecies was described by ROBIN MERE, *Ent. Gaz.*, **15**: 2: 73 (1964) from moths taken on the limestone hills of the Burren, Co. Clare, at Doughbrannan, where the insect frequents prostrate *Juniperus communis nana*. The larva can be obtained there in quantity in August by shaking the flattened branches over the smooth limestone pavement. Although reported to inhabit Ireland for many years it was not until Mere discovered the Burren colonies that Irish insects became properly known. On the Burren Juniper grows only at the higher parts of exposed hills and there it occupies fissures in the broad pavements and terraces, the plant does not grow at lower elevations so the habitat is quite unlike that occupied by Scottish *millieraria* which frequents groves of giant bushes, or the



Figs. 1-6 *Lithophane leautieri* Boisduval; figs. 7-11 *Euphyia luctuata* Schiff.

southern English *arceuthata* which has always occupied sheltered juniper sites on the chalk-hills and in recent years Cypresses and exotic conifers in gardens. The Irish insect feeds up rather more quickly than the English, for the bulk of my larvae had pupated by the third week of August in 1963 (a markedly 'late' season) whereas *arceuthata* feeds up well into October. However, Robin Mere was still able to beat wild larvae in the Burren during early September.

The only difference in appearance between *hibernica* larvae and *arceuthata* larvae is the colour of the head on the Irish insect, which is olive-brown or even yellowish, and in this respect it agrees with Scottish *millieraria*. The Irish larva shares with the other two insects the same thickset, stubby body, relatively large globular head and thick waxy cuticle. It is quite unlike any other British pug larva and rather resembles a saw-fly caterpillar.

Figures: Plate IV, figs. 8, 11 both last instar. On *Juniperus*, Doughbrannen, Co. Clare, 24.viii.1963.

EUPITHECIA INTRICATA Zett. *ARCEUTHATA* Freyer

When discussing this insect (*Proc. S. Lond. nat. Hist. ent. Soc.*, 1955, P. 162) in Part I of this work I incorrectly included Tamarisk in the list of foodplants eaten by the larva. There is no evidence to suggest *arceuthata* has ever eaten this plant and still less to have existed wild on it.

The reference to Eire under *arceuthata* in Part I should be deleted, only the subsp. *hibernica* is known from that country.

EUPITHECIA EGENARIA Herr.-Schäff. FLETCHER'S PUG

DE WORMS (8) uses the name Pauper Pug for this most recently discovered British Pug but this is misleading and follows HESLOP 1947 *Indexed Check-List* who assigned this name against *egenaria* on the assumption that moths recorded under *egenaria* during the last century were indeed the lime feeding insect. In fact, no true *egenaria* was known from Britain until 1962 and the early records have been referred to other species mainly *arceuthata* and *sobrinata* as Blair (1) has indicated. Here we have the absurd circumstance of an English name given to an insect that was not found in Britain until long after the name had been bestowed on it, the name having originally referred to an entirely different species.

The discovery of this pug in Britain has done much more than simply extend the known range of the moth northwards from central Europe, for the whole life history is now better understood, and significant advance has been made upon the work of LUNAK (4) and SCHUTZE (6); from their accounts it was believed that the emergence period of the moth was restricted to the latter part of May and early June, and that the life cycle was determined by the short and early flowering period of *Tilia platyphyllos* Scop. the large-leaved Lime. We now know that in the Wye valley the moth may reach peak emergence during the third week of June and that

the species is associated with *Tilia cordata* Mill. (*parvifolia* Ehrhart) the small leaved Lime, and that it does well in captivity on flowers of the hybrid *Tilia europaea* Linn. (*vulgaris* Hayne) the common Lime.

The first British specimens were recorded by ROBIN MERE in 1962 (5) and he reviewed continental literature and Schütze's paper (6). The moth is illustrated, with descriptive text, by FLETCHER (2) in the supplement to "Moths of British Isles" published by Coridon, and De Worms gave a little summary in 1963 (8). But Fletcher had been misled as to the correct identity of the Wye valley lime trees and De Worms repeated the error that *egenaria* was associated with *Tilia platyphyllos* in Britain as it was abroad, and he stated that *T. platyphyllos* was locally common in the British Isles, especially in the West Country. Now it may be true that this tree occurs more frequently in the Monmouth and adjacent country than elsewhere but it is still an uncommon tree and it certainly does not form woodland. At the Wye stations of *egenaria* there are no trees of *T. platyphyllos* in woodland conditions, indeed there is but a single specimen and that grows in a nearby churchyard.

It is clear that *egenaria* is not restricted to *T. platyphyllos* in Britain and it follows that the moth can be expected to occur wherever *T. cordata* forms well-grown woodland in Monmouthshire and Gloucestershire. It is likely that high canopy is a necessary environment and that optimum breeding conditions occur where the limes reach sixty feet and have been undisturbed for many years. Lime was formerly cultivated on a coppice system and the growth would be cut down at about the time it became suitable for the moth—about thirty feet tall: and few flowers would be borne until then. This cutting practice largely ceased during the 1939-45 war and many coppices have now grown into forest. The origin of the limes in the Wye district is obscure but it is believed that both *T. cordata* and *T. platyphyllos* were encouraged by monks of Tintern and other houses in order to provide flowers for bees over an extended flowering season: *T. platyphyllos* flowers in early June, *T. cordata* (and *T. europaea*) flowers in late June into July. Over the greater part of Britain only the common lime, *T. europaea*, is found and this has been planted, whereas *T. cordata* appears to be an indigenous species that grows mainly in the western counties adjoining the Severn. (Although *T. cordata* is certainly later flowering than *T. platyphyllos* its flowering period in the Wye valley will allow the larva of *egenaria* to complete its growth even if open flowers were not available for the entire larval period. And whereas *T. platyphyllos* is an uncommon tree, and *T. cordata* has a restricted woodland distribution, *T. europaea* is abundant both as specimens in parks and gardens and commonly as an avenue tree where it often forms continuous canopy that approaches woodland conditions. It would be surprising if *egenaria* had not colonised such habitats and perhaps MV light worked in well-chosen sites in the West Country might further extend its known range.

The moth itself has been likened to *castigata* but I find it closest in appearance to pale examples of *lariciata* which shares a similar shape and pattern and intensity of median line. The larva of *egenaria* in no way resembles *castigata* which is coarsely rugose and has a series of

dorsal diamonds; instead it has the same tapered body as *lariciata* but its head is much smaller. The larva is also very similar to those of *pimpinellata*, *subumbrata* and *assimilata*. Schütze (6) thought *egenaria* to be closely related to *pimpinellata* on grounds of similarity in their genitalia.

The life history of *egenaria* was fully described in 1936 by LUNAK (4) and next by SCHÜTZE in 1954 (6) who gave coloured illustrations of egg, larva and pupa. (Schütze's paper was summarised by MERE (5) and by WAKELY (7). The habits in Britain are described by HAGGET and MERE (3) based on their experiences in 1963 and they reared the species on a very large scale after another visit to the Wye valley during the following year and fully confirmed the work of the earlier authors.

Female moths were found to live fully a fortnight after capture, fertile eggs were laid by some moths immediately, by others not until after ten days. A few eggs were laid on flower bracts otherwise the whole of 250 eggs were deposited on buds of *T. cordata*, some singly, many in twos and threes, occasionally in clusters of up to 20 eggs, but these were then laid side by side and not piled. The egg was very large for the size of moth and powdery blue-white when laid, they hatched in 10-12 days. In the early instars the larva closely resembled the style of the lime flower and it was well camouflaged within the blossom. At full growth the larva simply sat amongst the flower stalks and it became easy to see only just before pupation when it assumed a glaucous green. It was a very robust larva with remarkable strength in both the anal claspers and the thoracic legs; it seemed to be a larva that could well withstand high winds in the treetop—and incidentally resist the beating stick as well. It gripped tightly in all instars until very fully grown and then it might drop easily.

When fed upon flowers of *T. europaea* the small larvae ate only the anthers, later the stamens as well and these they liked to break off and feed into the mandibles as we might eat a stick of celery. Sepals were ignored and the petals eaten but rarely: in the last instar the whole of the style was eaten. None of the larvae ate the leaf and the instance recorded *Ent. Gaz.* 15: 25 by Mere would suggest that larvae might subsist on foliage only in emergency. At no time did any larva attempt to spin together the parts of the flower. Large quantities of bright ginger-red frass were passed. There were three moults and the time spent in the larval stage varied from 12 to 18 days, that is from time of hatching until spinning up. There were no precocious emergences and all pupae produced moths during the following spring. It was a very easy species to rear.

Description of larva

The first instar larva is a pale cloudy ochreous-grey, the characteristic features being the uniformly black-brown head and black thoracic legs, and purplish-plum coloured dorsal blotches along the alimentary tract; its prothoracic plate is dusky brown and is broadly divided at the centre, its anal plate is divided posteriorly into two short sturdy spikes. In the second instar the head is pale grey otherwise no change in appearance. During

the third instar the abdomen becomes deeper yellow and by the end of that instar the body assumes the delicate pale green hue.

Description of fourth (last) instar larva

Measures to 25 mm. long, slender with taper only at thorax, broadest at the fourth and fifth abdominal rings, there is similar tapering dorso-ventrally. The skin very soft, not shiny, a pronounced lateral flange, much transverse wrinkling of the thoracic and posterior abdominal rings. the skin itself coarsely granulated when viewed under a strong lens, carrying short, fine bristles but these are evident to the naked eye only on the posterior abdominal rings and here the bristles are fewer and all directed backwards. Colour a delicate pale green, the sole ornamentation being the intersegmental folds of the abdomen which appear a conspicuously blanchd yellow, and the broken line of the dorsal vessel which shows through the skin as a series of pulsating dark streaks; the skin is marked beneath by a single broken stripe composed of whitish streaks which are best developed on the abdomen. The head pale ochreous-grey, the ocelli deep black, the shape flattened in front, rounded not pointed, the mouthparts darker. True legs plain ochreous-grey. Prothoracic plate weak, green, unmarked. Anal flap dulled, ochreous-grey tinged with pink, the margins so pale as to appear white: the whole of the flap and its body ring may appear suffused with orange just before frass is passed. Prolegs on sixth abdominal ring are green, tipped with grey, anal claspers ochreous-grey, there are twin conical projections beneath the flap and these may be coloured reddish.

The colour of the larva varies depending upon age and how recently it has eaten: from the plain creamy hue of earlier instars the skin may assume any intermediate shade of green through to deep emerald before it ceases feeding: it can even appear quite grey with purplish blotches.

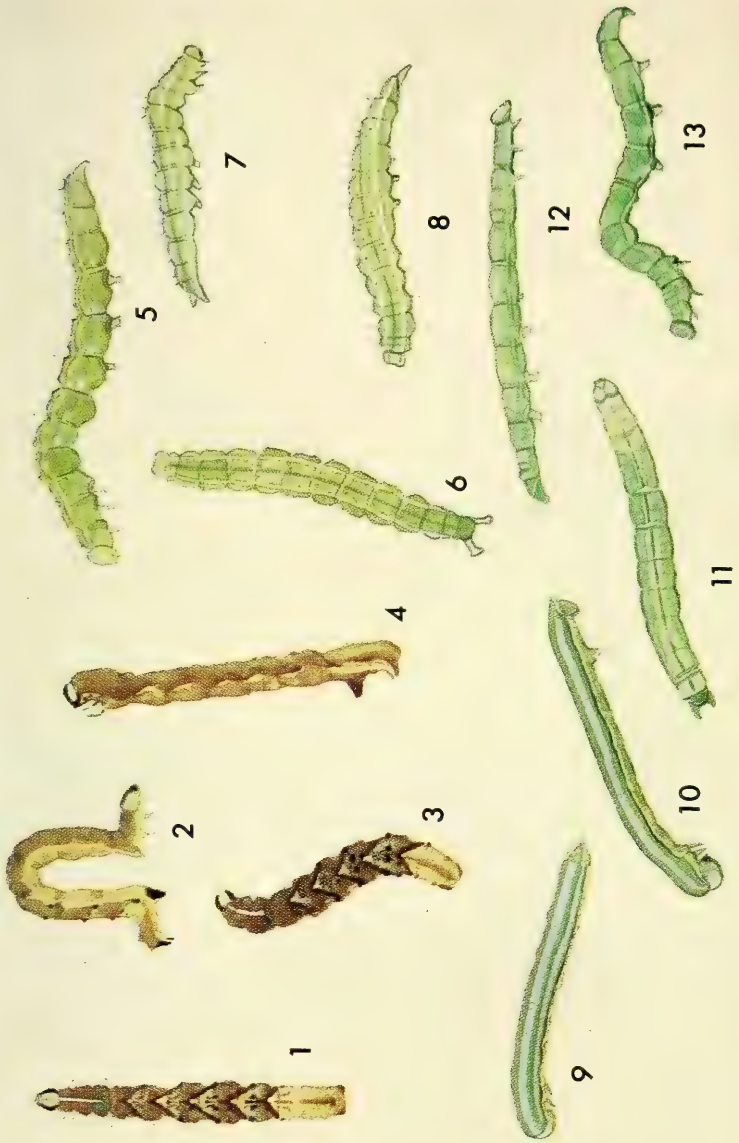
Figures: Plate IV, figs. 9, 10, 12, 13 all last instar, on flowers of common lime *Tilia europaea*, reared from Wye valley female, 12.vii.1964.

References

- (1) Blair, K. G., 1951, *Entom.*, **84**: 158.
- (2) Fletcher, D. S., 1963, *Coridon*, Series B, No. 4.
- (3) Haggett, G. M. and Mere, R. M., 1964 *Ent. Gaz.*, **15**: 25.
- (4) Lunak, R., 1936, *Z. öst. Entver*, **21**: 15.
- (5) Mere, R. M., 1962, *Ent. Gaz.*, **13**: 155.
- (6) Schütze, E., 1954, *Abh. Ber. Ver. Naturk Kassel*, **59**: 7.
- (7) Wakely, S., 1957, *Ent. Rec.*, **69**: 199.
- (8) De worms, C. G. M., 1963, *Ent. Gaz.*, **14**: 106.

POECILOPSIS LAPPONARIA Boisd. RANNOCH BRINDLED
BEAUTY

A very full account of the life history and description of the larva of this moth is given in Buckler, vol. VII, pp. 11-15, by F. W. FROHAWK, the notes having earlier appeared in their entirety in *Entom.* **28**: 237. The



Figs. 1-4 *Lampropteryx otregiata* Metcalfe; figs. 5-8 *Hypena rostralis* Linn.;
Figs. 9-10 *Thera variata* Schiff.; figs. 11-13 *Colobochoyla salicalis* Schiff.

reference to figures given in the text relates to the earlier publication for there are no illustrations of this larva in Buckler.

A number of plants are said to be eaten including *Calluna*, *Erica*, birch, sallow and hawthorn, and bog-myrtle. Regarding its choice of foodplant in a wild state Dr. COCKAYNE wrote, "The younger larvae were usually on *Calluna* and the larger ones on *Erica tetralix* eating both flowers and leaves. I did not find that bog-myrtle is the favourite food." (*Ent. Rec.*, 63: 134.)

Figures: Plate V, figs 13, 15 both last instar, from H. E. HAMMOND, ab ovis, Struan, Perthshire, female, figured 24.vi.1951, reared on sallow.

ORTHOLITHA MUCRONATA Scopoli. LEAD-BELLE

Since publication of my earlier work in this series (Part VI in *Proc. S.L. ent. nat. Hist. Soc.*, 1961) I have seen many more larvae and wish to add the following details to that account.

Occurrence of larvae

September is about the earliest time of year that larvae can be found, and during the fourth week of this month in 1964 I found larvae on Gorse at Tregaron, Cardiganshire. At Goonhilly, Cornwall, I found a few at the end of November, 1960. The latest time that I have had larvae was on 31st March, 1966, when I collected them, again on Gorse, in the Black Mountains of Breconshire, near Hay, at 1600 feet elevation above sea-level and exposed to the west; they began to spin up a week later.

Variation of larval colour

I had the chance to rear a large number of *scotica* larvae from Aviemore, Inverness-shire, females in 1960 and found that about a quarter of them were similar to the pale form of southern insects, but still with the smoky hue that is typical of *scotica*. Larvae of *umbrifera* were very common on Dartmoor on 9.xii.1964 and I collected 146 of them in a couple of hours: 66 were of the pale form, 66 were grey, and only 14 were heavily marked.

Editorial Note

It is proposed to publish a further part with an eleventh plate later in the current volume. This will illustrate the two Noctuidae: *Coenophila subrosea* Steph. and *Trisateles emortualis* (Schiff.).

CURRENT LITERATURE

BOOKS AND MONOGRAMS

CLAPHAM, A. R., TUTIN, T. G. and WARBURG, E. F., **Excursion Flora of the British Isles**, 2nd Edition, 1968, pp. xxxv and 586. C.U.P. Price 30/-.

The first edition of this invaluable book appeared in 1959, and it is symptomatic of the lively state of British field botany that a new edition is published after just nine years. The main purpose of the book is to enable students to identify all except critical species with ease and

confidence in the field, and it is gratifying to note that among other improvements the main key is now wholly dichotomous—the inclusion in the first edition of occasional three and even four-alternative sections was apt to trap the unwary. It is perhaps annoying to anyone who cannot recognise a member of the *Lemnaceae* at sight to find that fertile material is required before it will key out, but otherwise the keys are altered little and seem to work very well. On the whole, they have been modified to include the newly discovered species and segregates, but there is an inconsistency in that while certain of the new species are included in the keys, others are appended as footnotes under related species.

The major taxonomic change which has been incorporated in the new edition is a completely revised classification of the ferns, the chief feature of which is the splitting of the old family *Polypodiaceae* into ten separate families. Some species, such as *Papaver lecoqii* Lamotte, are better understood now and better defined; there are some inevitable alterations in nomenclature, and revised accounts of distribution. Two extra figures are included, showing the structure of an orchid flower and a grass spikelet. The point is made in the prefaces that not all the latest views on taxonomy and nomenclature have been incorporated, lest the Excursion Flora be made to diverge too far from the larger British Flora, by the same authors. The book under review is essentially a companion to the larger "C.T.W." and for that reason the fact that the index does not take one beyond the genera is unimportant, and justified on the ground of space saved.

Every naturalist ought to own this book, and while he may prefer to keep it on the back seat of his car, it is robust enough to live stuffed into his rucksack. However, for those who already possess the first edition, the new one probably does not contain sufficient that is new to merit its special purchase.

B.G.

D. S. FLETCHER, 1967

A Revision of the Ethiopian Species and a Check List of the World Species of *Cleora* (Lep., Geometridae). Bull. Brit. Mus. (nat. Hist.) Ent. Sup. 8)

Why should genera, such as *Boarmia*, which we have known since our youth, now be split into a number of genera (e.g., *Cleora*, *Ascotis*, *Alcis* and *Peribatodes*) each with only one or two representatives in Britain?

A perusal of the work under review provides a satisfactory answer to the above question, and leaves no room for complaints of needless splitting.

The African species alone, treated at length in this revision, number forty-six, of which twenty-two are described here as new. In the check-list of world species there are over 200. The author, indeed, has included numerous species previously separated in two related genera: *Carecomotis* Warren and *Neocleora* Janse, and also sinks other generic names as synonyms of *Cleora* Curtis. Yet only one of all these *Cleora* species is British, or even European, namely, *C. cinctaria* Curtis (The Ringed Carpet). A better illustration could hardly be cited of the need to study each group

on a world-wide basis before concluding that the last word has been said about its nomenclature.

The work consists of over 100 pages, 14 plates and 146 text figures. Among the plates are distribution maps, and the text figures consist of excellent drawings of the male and female genitalia. These organs, together with the neurulation and the equally characteristic wing-pattern and abdominal ring, provide the morphological grounds for the genus as the author conceives it. But he points out that habitus resemblance, taken by itself, may be deceptive. *Ascotis* Hubner, with its well-known representative *selenaria* Schiff., is thus to be distinguished on structural grounds, as are at least five Indo-Australian genera.

In the main body of the work, previously known species are re-characterised in the same style as the new descriptions. At the end, species are listed whose removal from *Cleora* was found necessary, with the correct genus where possible.

The work as a whole lives up to the rigorous standards of the Museum and we highly recommend it to students of the taxonomy of the Geometridae.

E.P.W.

OUR CONTEMPORARIES

Alexanor, *Revue des Lépidopteristes français*: 5, fasc. 5, 1968

This excellent magazine's latest part opens with an admirable ten-page article by J. Bourgonne on the word "type," so often used incorrectly by the uninitiated. The author discusses the meaning of holotype, lectotype, neotype, syntype, paratype, and lectoparatype, which alone are admitted by the International Code of Zoological Nomenclature, Articles 61-75. Anyone who can understand French will find this exposition clearer than the Code. One hopes that there will be no more loose talk of varieties "darker (or lighter) than type" where the speaker has not actually compared with the actual specimen which constitutes the holotype, lectotype, or neotype.

Next, a short article by H. de Lesse discusses a form of *Agrodiaetus ripartii* Freyer flying near Barcelona, and the validity of the combination *A. admetus agenjo* Forster in the light of the author's chromosome-studies.

There are two other articles on Iberian Lepidoptera: one, a single page by E. de Lajonquière concluding a longer first instalment in the preceding volume; the other, a contribution to a revision of the Psychid genus *Oreopsyche* by J. Bourgonne, who reduces the number of species in the genus provisionally to 23. There is a good plate of species from Spain, Portugal and S. France and also an English summary at the end.

Among other articles are an account of an entomological voyage in Corsica by J. J. de Granville and one by C. Herbulot on some Sardinian Geometridae. Finally, the last instalment of Charles Boursin's list of *Noctuidae-Trifinae* of France and Belgium provides the correct nomenclature, according to this recognised authority on the group, of the species in the genera *Gortyna* O. to *Axylia* Hübner, the latter being placed

in the *Melicleptriinae* after *Periphanes delphinii* L., the Pease-blossom. Most of our readers are accustomed to follow South and Heslop and place *A. putris* soon after *Ochropleura plecta* L., whence already in 1909 F. N. Pierce had removed it to the vicinity of *Arenostola*, in which few if any followed him. Boursin's list, of course, contains a number of generic names and combinations which entomologists in this country have not yet adopted, and in this part one notes as examples: *Charanyca trigrammica* Hufn., *Athetis pallustris* Hübn. and *Chloridea* instead of *Heliothis*. It would be impractical to suggest that our contributors should henceforth follow Boursin's nomenclature as it is not easily available to the majority of our members. Until our own check-lists are revised to conform, contributors may continue as recommended by the previous editor to follow Heslop's list, observing, if possible, the modifications recommended in our 1960-2 volumes.

E.P.W.

SHORT NOTES

Danaus plexippus in Sussex—In the sunny morning of October 15th a large brown butterfly sailed into my garden from the south-east, fluttered up and down the bungalow wall, then settled momentarily within a yard of me on a sunflower where I had an excellent but too brief view of *Danaus plexippus* (L.). Before I had recovered from my surprise it had sailed away over the roof in a north-westerly direction. W. H. SPREADBURY, 3 Sherwood Road, Seaford, Sussex.

Nymphalis antiopa L. in Surrey—On the 7th September, 1968, at Wentworth, Surrey, a "large dark butterfly" was seen at a window of The Corner Green House. The following evening (8.9.68) Mr. A. H. Bishop, of Sunninghill, Berks, a guest interested in Lepidoptera, after being informed of the butterfly's presence the previous day, found the right fore and hind wings of a specimen of *Nymphalis antiopa* L. on the lawn. He brought the two wings to the Natural History Museum for confirmation of his determination of the species and has kindly presented them to the museum. The wings, though worn, are entire and have portions of the basal attachments to the thorax still present. The borders are a pale cream typical of specimens taken in Britain. T. G. HOWARTH, Department of Entomology, British Museum (Natural History).

Nymphalis antiopa L. in Oxford—In a letter to the museum, Mr. Martin F. Heyworth of Oxford reports that on the 10th September he "saw a Camberwell Beauty butterfly in the centre of Oxford. The sighting was made at 5.30 p.m. under cloudy conditions. There is no doubt in mind regarding the identification—the insect was first observed in flight, and subsequently settled on the wall of a building at about 10 feet above ground-level. When the sighting was made I was on the pavement immediately below this building. The borders of the insect's wings were white rather than yellow, and the specimen was in good condition, being, as far as I could see, undamaged." T. G. HOWARTH, Department of Entomology, British Museum (Natural History).

A REVIEW OF THE MACROLEPIDOPTERA OF THE LONDON AREA FOR 1966 AND 1967

By C. G. M. DE WORMS, M.A., PH.D., F.R.I.C., F.L.S., F.R.E.S

Introduction

In my last biennial review for the years 1964 and 1965 (De Worms, 1966), I drew special attention to the paper which appeared in the *Proceedings and Transactions of the South London Entomological and Natural History Society*, 1963, on the survey of the flora and fauna of the gardens of Buckingham Palace. This work included a long list of the Lepidoptera recorded in that most interesting part of London up to the end of 1964. The mercury vapour light trap has continued to be run there on favourable occasions throughout the ensuing seasons but, though naturally the new additions become annually less frequent, nevertheless further records have been made of species rather unexpected in the innermost area of the Metropolis.

A number of former recorders have been good enough to send in their observations again and several new workers in the field have also recorded most useful information about parts of the Area not covered in earlier reviews. To all such, I would like to express my special gratitude; some indeed have compiled most comprehensive and valuable lists of their local species.

As previous reviews have appeared elsewhere, it should first be explained that the Area is a circle of radius twenty miles from St. Paul's Cathedral. The numbers refer to the contained parts of the Watsonian Vice-Counties, with the prefix of the initial letter of the County for readier recognition.

All these records are now of special importance in view of the National Survey of the British Macrolepidoptera which is being undertaken by the Nature Conservancy in their Biological Records Centre at Monk's Wood, Huntingdon.

Both the winters of 1965-6 and of 1966-7 were extremely mild ones with very little prolonged cold or severe snowstorms. Both years, therefore, started precociously, but bleak periods supervened in both springs, especially in May, 1967, which was one of the coldest recorded this century. However, the respective summers were very different. In 1966 there was hardly a warm spell at all, whereas in 1967 both in June and, above all, during July, the sun shone almost continuously with the thermometer well in the 70's almost daily. Mid-July of that year produced a real heat wave, with a further very warm week at the end of August. There were some glorious days, too, in September and October, 1967.

What were the general comparisons between the two seasons as regards the Lepidoptera? Certainly there was a big influx of migrants both in March and in May of 1966. It proved to be one of the best years this century for *Vanessa cardui* L. (Painted Lady), which was about in vast quantities with a fair proportion of *V. atalanta* L. (Red Admiral); they both found their way well into the London Area. *Macroglossa stellatarum* L. (Humming-bird Hawk), too, was fairly frequent that summer.

All these three species were extremely scarce in 1967, during the beginning of which, in the first week of February, a big immigration must have taken place: for no less than three examples of that very rare migrant *Tathorrhynchus exsiccata* Lederer (Levant black-neck) were taken at light near Winchester together with several other migrant species, particularly among the Pyrales. Again 1967 saw a large number of *Colias croceus* Fourcroy (Clouded Yellow) over the southern part of England with several records within the bounds of London.

Turning in detail to the more outstanding records, for 1966 certainly the most surprising capture was that of a perfect male *Apatura iris* L. (Purple Emperor) on the edge of some woods between Northwood and Moor Park by Master J. MAJERUS in early July. It was quite by chance that Mr. G. PRIOR was collecting in that vicinity when he happened to meet young Majerus, who took him to see his prize, which he had not appreciated when he caught it on the ground. This grand insect used to exist in most of the woods round North London, including Epping Forest, but that was well back in the last century, and I am not aware that it has been seen anywhere in that region this century.

Another spectacular capture reported for M.21 was that of *Lampides baeticus* L. (Long-tailed Blue) taken in a garden at Finchley by L. SMITH on October 18th, 1967 (vide *Bulletin Amateur Entomologist's Society* 27: 71). The only previous record of this very widespread migrant for M.21 was a specimen taken at Greenford in the phenomenal summer of 1945.

Mention has already been made of the arrival in the Area of *V. cardui* and *V. atalanta* during 1966. It was also a good year for *Celastrina argiolus* L. (Holly Blue), which was reported as abundant by Mr. A. A. ALLEN in the south of the Area, at Carshalton, at Blackheath, and on Esher Common in August (*Ent. Rec.* 79: 23). It was also fairly common in the following spring, April, 1967, near Bromley, Kent (Jacobs: *Ent. Rec.*, 79: 178). Otherwise, not so many unusual insects or rarities seem to have visited the Area in these two years as in the first five years of the present decade, though 1967 provided more than its predecessor.

Probably the most interesting records are those from INNER LONDON, particularly the Buckingham Palace survey. One of the unexpected visitors to the light trap in the grounds of the Palace during 1967 was a male *Euproctis chrysorrhæa* L. (Brown-tail), a species which has not penetrated into London for many years. The nearest recent record is of a nest of larvae found in Hounslow in 1949. During the latter half of the 19th century it was a veritable pest in the Metropolitan Area, its stinging larvae denuding trees in the parks and festooning them with their tough nests. Now this moth seems to be confined chiefly to our seaboard in the east and south-east from Suffolk to the Isle of Wight. It is to be hoped that this single capture is only a stray and that London has not once more become the home of this pest.

Another most unlikely inhabitant of the Central London Area was a female *Hepialus hecta* L. (Gold Swift), also taken in the trap in Buckingham Palace Gardens in July, 1965, but only recently recognised. This

species feeds in the roots of bracken of which there is apparently a large clump in the Palace gardens. Normally it is to be found flying at dusk in large woods where this fern flourishes. There are old records for Hampstead Heath.

Among the butterflies of Inner London in 1967, by far the most remarkable was the sight of a *Nymphalis antiopa* L. (Camberwell Beauty), at rest for a fleeting moment on the bumper of a car in a Kensington square in early August. This record has been fully authenticated. Most probably the last time this famous migrant was seen in this part of London was when one was found flying inside the Natural History Museum at South Kensington shortly after World War II. Among the regular migrant moths in 1966 was at least one specimen of *Rhodometra sacaria* L. (Vestal) taken by Prof. DACIE at his home in Wimbledon in September. He also obtained *Nycterosea obstipata* Fabr. (Gem) there in July, 1966. Several newcomers to our shores seem to be steadily increasing their range: one of these is *Hadena compta* Schiff. (Varied Coronet) which first appeared as a resident in 1948 in Kent and has now spread well into the Area. A new station for it is near the easternmost limit at Pinden near Dartford where Mr. E. J. HARE reported it for the first time in July, 1967.

Once more London has the pride of recording the first example of a species new to the British Isles: in October, 1967, at his home at Totteridge, Mr. R. I. LORIMER noticed a small, dark *Caradrina* which seemed not quite to accord with the species of this genus with which he was familiar. He sent it to the Natural History Museum, whose authorities in turn sent it to that eminent French authority, M. Charles Boursin of Paris, who pronounced it to be an example of *Caradrina flavirena* Hübner, an insect of essentially Mediterranean habitat and origin, which has somehow reached us, unless indeed it has already become a resident without having been previously recognised.

Quite a sensation was caused in the autumn of 1967 when Dr. SVENSSON of Sweden announced that *Amphipyra pyramidea* L. (Copper Underwing), a very prevalent late summer Noctuid, in fact embraced two distinct species as shown by the examination of the genitalia of many individuals. When a number of British examples were examined it soon became clear that both species were equally plentiful in the southern part of Great Britain and specimens both new and old of the newly separated species have been found emanating from most of the Vice-Counties in the Area. This new addition to our list has been named *Amphipyra berbera* Rungs. The separation characters were formally described by D. S. FLETCHER in *Ent. Gaz.* 19: 2 (1968), p. 91, where the name of *svenssoni* was also given to the particular subspecies to which our English form belongs. It can be distinguished from true *pyramidea* by its generally duller drabber ground colour without the sheen of *pyramidea*; the central mark of the forewings is always oval in the new species whereas it is smaller and round in the authentic Copper Underwing.

Analysis by Vice-Counties

In the following paragraphs, species new to each Vice-County within the Area are marked with an asterisk.

INNER LONDON:

Nymphalis antiopa L. (Camberwell Beauty), Kensington, viii.67.

**Euproctis chrysorrhæa* L. (Brown-tail), Buckingham Palace Garden, vii.67.

**Hepialus hecta* L. Buckingham Palace Garden, vii.65.

**Nola cucullatella* L. (Short-cloaked), Buckingham Palace Garden, vii.66.

**Drepana lacertinaria* L. (Scalloped Hook-tip), Buckingham Palace Garden, vii.67. (Its foodplant, *Betula* (birch) is far from common in Inner London.)

Pheosia tremula Clerck (Swallow Prominent), Buckingham Palace Garden. (A newcomer to the Palace list though not to Inner London, as it used to be taken regularly at the moth-trap run in the Zoo in the 1950's.

Procus literosa Haworth (Rosy Minor), Buckingham Palace Garden, 1967 (a re-appearance).

A further most unexpected visitor to the Palace trap in June, 1966, was *Lygephila pastinum* Treits (The Blackneck),* an insect of open country and woodlands.

Chesias legatella Schiff. (Streak), Buckingham Palace Garden, xi.1967.

Erannis defoliaria Clerck (Mottled Umber), Buckingham Palace Garden, 1966.

Other interesting observations from the innermost part of London include several sent in by Mr. G. H. GUSH, who observed *Pararge megaera* L. (Wall) in St. James' Park on June 1st, 1966, and in 1967 **Coenonympha pamphilus* (Small Heath) and *Pararge aegeria* L. (Speckled Wood) in May and July respectively in the same Park, the latter being a reappearance. Archbishop's Park at Lambeth provided quite a spate of butterfly records in 1966, for Mr. GUSH noted there: *Pieris napi* L. (Green-veined White) (17.v), *Vanessa atalanta* L. (Red Admiral) first on 29.iii, again in v and ix, and *Vanessa cardui* L. (Painted Lady) together with *Maniola jurtina* L. (Meadow Brown) in ix, and *Anthocharis cardamines* L. (Orange-tip) with the common Whites on 19.v. *Polygonia c-album* L. (Comma) turned up in the Abingdon Road Gardens in x.1967, while *Nymphalis io* L. (Peacock) was seen in 1966 in Archbishop's Park and in viii.1967 in Lord North Street. Mrs. JANET SAUNDERS reported an abundance of larvae of *Callimorpha jacobaeae* L. (Cinnabar) in the vicinity of the Festival Hall in August, 1967.

MIDDLESEX (M.21):

Apatura iris L. (Purple Emperor) leg. MICHAEL MAJERUS near Moor Park, vii.1966 (for details see Introduction).

Lampides baeticus L. (Long-tailed Blue), x.1967, Finchley (ditto).

Also from M.21, recorded by Mr. G. PRIOR.

Pararge aegeria L. Copse Wood, Northwood; and Bayhurst Wood,

Harefield; and *P. megaera* L. from the same two, and also Pinner.

Maniola tithonus L. (Hedge Brown), Hanger Hill, Ealing.

Polyommatus icarus Rott. (Common Blue), a strong colony at Harefield.

Celastrina argiolus L. (Holly Blue), Hanger Hill, Ealing, in 1966.

Thymelicus sylvestris Poda (Small Skipper), Hanger Hill, Ealing; also North Harrow, Pinner Park and at Harefield.

V. cardui L. Copse Wood, Northwood, and North Harrow, 1966.

C. croceus Fourc. Copse Wood, 1967.

Pheosia tremula Clerck (Swallow Prominent), North Harrow and Northwood.

Notodonta dromedarius L. (Iron Prominent), Harrow, not previously observed there.

Drepana binaria Hufn. (Oak Hook-tip), to light, Harrow.

Noctua interjecta Hübn. (Least Yellow Underwing), North Harrow, last reported from there in the 1898 list.

Scopula lactata Haw. (Cream Wave), Copse Wood, North Wood.

Scopula imitaria Hübn. (Small Blood Vein), North Harrow.

Ellopija fasciaria L. (= *prosapiaria*) (Barred Red), Harrow.

Deuteronomos erosaria Schiff. (September Thorn) and *D. fuscantaria* Haw. (Dusky Thorn), Northwood.

Chiasmia clathrata L. Hanger Hill, a strong colony.

Also from M.21, recorded by Mr. B. R. STALLWOOD: from Sunbury, near Kempton Park Racecourse, *V. cardui*, *P. c-album*, *V. atalanta*, *P. aegeria*.

A specimen of *Amphipyra berbera* Rungs. subsp. *svenssoni* Fletcher has been identified, taken at Potter's Bar in 1906.

HERTS (H.20):

Species recorded by Mr. R. I. LORIMER at Totteridge include:

**Caradrina flavirena* Hübn. (Lorimer's Rustic), x.1967.

**Pachynemius hippocastanaria* (Horse Chestnut), 17.ix.1966: this peculiar heathland geometer apparently hibernates and has not been recorded before from this part of H.20.

Nycterosea obstipata Fab. (Gem), x.1966.

**Eupithecia lariciata* Freyer (Larch Pug), vi.1966 (not previously noted for this part of H.20).

**Bomolocha fontis* Thunb. vii.1967 (Beautiful Snout): usually a denizen of regions covered with *Vaccinium* (Bilberry), its foodplant, which does not grow near its place of capture.

Hemistola immaculata Thunb. (Small Emerald), vii.1967.

**Melanthia procellata* Fab. (Pretty Chalk Carpet), vii.1967.

(The last two insects mainly inhabit chalk downs where *Clematis vitalba* L. (Traveller's Joy) flourishes, and are rather unexpected visitors at Totteridge.)

Species recorded by Mr. BARRY GOATER at Bushey in 1967 include:

Polyplocia ridens Fab. (Frosted Green), very melanic examples in iv.

Apatele tridens Schiff. (Dark Dagger), vi.

Eumichtis adusta Esp. (Dark Brocade).

Spaelotis ravida Hübn. (Stout Dart), viii (an occasional visitor to the Area).

Tholera cespitis Fab. (Hedge Rustic).

Brachionycha sphinx Hüfn. (Sprawler), xi.

Nycterosea obstipata Fab. (Gem), vii and viii.

Tethea duplaris L. (Lesser Lutestring), viii.

Noctua pronuba L., *Amathes c-nigrum* L. and *xanthographa* Fab., viii, all numerous in the light trap: (350 *pronuba* in one night, over 100 *xanthographa* in one night).

The same recorder observed from Elstree during 1967:

Leucoma salicis L. (White Satin).

Jaspidia pygarga Hüfn. (Marble White-spot).

**Eupithecia subumbrata* Schiff. (Shaded Pug).

Brachionycha sphinx Hüfn.: abundant in xi at Haberdashers' School, including a melanic male ;this form is becoming commoner.

Philereme vetulata Schiff. (Brown Scallop) and *P. transversata* Hüfn. (Dark Scallop) both as larvae.

The same recorder also noted from near Watford at end of iii.1967 *Gypsites leucographa* Hübn. (White-marked), a very early date and a reappearance.

Mr. G. PRIOR'S list of observations for H.20 for the two seasons includes:

C. croceus Fourc. near centre of Rickmansworth, 1966.

Aphantopus hyperanthus L. (Ringlet), a flourishing colony in Whippendell Wood, of small size with faint eye-spots.

V. cardui L. and *P. c-album* L. around Rickmansworth, 1966.

Celastrina argiolus L. (Rickmanworth).

Deilephila elpenor L. (Large Elephant Hawk) and *Ceramica pisi* L. (Broom), larvae at Rickmansworth.

Mormo maura L. (Old Lady) in Rickmansworth town (now becoming quite a rarity in the Area).

Nonagria typhae Thunb. (Bulrush Wainscot), *Anchoscelis litura* L. (Brown-spot Pinion) and *Tiliacea citrigo* L. (Orange Sallow) at Moor Park.

Eulype hastata L. (Argent and Sable) in vi and *Oporinia autumnata* Borkh (Autumnal Carpet) and *Colotois pennaria* L. (Feathered Thorn) in autumn, all three near Rickmansworth; also from the same neighbourhood: *Zygaena filipendulae* L. (Six-spot Burnet) and *Z. trifolii* Esp. (Five-Spot Burnet).

A specimen of **A. berbera* Rungs. subsp. *svenssoni* Fletcher taken at Oxhey Wood in H.20 has been discovered.

SOUTH ESSEX (E.2.18)

Mr. K. M. GRIMWOOD has once more sent in a most comprehensive list of his captures at Ingrave, near Brentwood, during 1966 and 1967, with comparisons as to the relative abundance in the two seasons of the 280 species comprised in the list. Among the butterflies, *V. cardui* was quite numerous in 1966 while only one was seen in 1967; again *Celastrina argiolus* turned up fairly commonly in 1967 while none were seen in

1966. When the list of the butterflies of the London Area was published in 1951, *Pararge aegeria* L. was virtually unknown in this part of Essex or, in fact, in E.2.18 as a whole. Now it is quite widespread there. *Thymelicus lineola* Ochs. (Essex Skipper) was again common in both years.

Among the moths, most were species which had appeared in 1964 and 1965, especially the Sphingidae (Hawk-moths) and Notodontidae (Prominents). In both years *Polyplocia ridens* was frequent. In 1967 *Euproctis chrysorrhæa* was common, with only one previous record (at Loughton) for E.2.18. But of course it swarms at Benfleet just outside the Area. *Gastropacha quercifolia* L. (Lappet) appeared in 1966 and one *Saturnia pavonia* L. (Emperor) that year; both are of very sporadic appearance in the Vice-County. For 1965 Mr. Grimwood was able to provide an authentic record of **Arctia villica* L. (Cream-spot Tiger) of very uncertain existence in Essex. In both years *Drepana binaria* Hufn. was quite common. Other records from Ingrave included:

**Eilema complana* L. (Scarce Footman).

Zygaena trifolii Esp. (first record in E.2.18 since 1865 when it occurred in Epping Forest).

**Lycophotia varia* Vill. (True Lover's Knot), numerous, 1966 and '7.

**Noctua interjecta* Hübn. (Least Yellow Underwing), numerous, 1966 and 1967.

Pyrrhia umbra Hufn., 1967.

Hadena compta Schiff. (Varied Coronet), 1966 and '7. This species seems to be spreading rapidly throughout the Area.

The three marshland species: *Nonagria dissoluta* Treits. (Brown-veined Wainscot), *Rhizodra lutosus* Hübn. (Large Wainscot) and *Leucania obsoleta* Hübn. (Obscure Wainscot) each in single specimens, were newcomers to Ingrave, having only been noted in the Tilbury Marshes before World War II.

E. adusta Esp. was another unusual visitor, with only one earlier record from Hale End. The same can be said of *Eremobia ochroleuca* Schiff. (Dusky Sallow), quite numerous in both years, yet with hardly any previous captures for E.2.18. Singletons of both *Antitype flavicincta* Schiff. (Large Ranunculus) and of *Cucullia chamomillae* Schiff. (Chamomile Shark) appeared in 1966, both with only records from the western end of the V.-C. Several **Lygephila pastinum* Treits. (Black-neck) came to light in 1966 with a single **Zanclognatha cribrumalis* Hübn. (Dotted Fan-foot). Other species new to this V.-C. were: **Sterrha vulpinaria* H.-S. (Least Carpet), not hitherto noted in the Area north of the Thames; **Lobophora halterata* Hüfn. (Seraphim (one in 1966); **Perizoma alchemillata* L. (Small Rivulet) (several in 1966); **Ennomos autumnaria* Wernb. (Large Thorn), a few in 1967; **Aspitates ochrearia* Ross. (Yellow Belle), one in 1967.

Bapta distinctata H.-S. (Sloe Carpet) was numerous in 1967. Finally, during 1967, out of 150 *Biston betularia* L. taken at light, 92% were of the black form *carbonaria*.

NORTH ESSEX (E.1.19)

As before, there are virtually no new records except for **A. berbera svenssoni* Fletcher as mentioned in the Introduction.

NORTH KENT (K.16)

**A. berbera svenssoni* has also been found in the collection of Mr. E. J. HARE who lives at Pinden, near Dartford, which of course is in K.16. Other interesting captures which he made during the two years there include **Hadena compta* Schiff. (Varied Coronet). Also he took there in 1967 a female of *Xanthorhoe quadrifasciaria* L. (Large Twin-spot Carpet) from which a good series is being bred. Melanic forms of both *Agrotis ypsilon* Hufn. (Dark Swordgrass) and *Amathes xanthographa* Schiff. (Square-spot Rustic) were unusual captures for this part of England.

Also for K.16, Mr. C. G. BRUCE at Lee reports the reappearance in his garden in 1967 of the now scarce *Acontia luctuosa* Schiff. (Four-spotted); also two *Orthosia advena* Schiff. (Northern Drab) and many *Leucoma salicis* L. (White Satin), *Tethea ocularis* L. (Figure of Eighty), *Clostera curtula* L. (Chocolate-tip) and *Sterrrha vulpinaria* H.-S.

From West Wickham in 1967 Mr. J. M. CHALMERS-HUNT records *Apamea scolopacina* Esp. (Slender Brindle), *Colocasia coryli* L. (Nut-tree Tussock) and *Deuteronomos erosaria* Borkh. (September Thorn).

From a list of 214 species of moths recorded by Mr. DENNIS O'KEEFE from his home at Bexley during 1966 and 1967, the following may be mentioned:

Lophopteryx cucullina Schiff. (Maple Prominent) a + in 1966; this species is usually associated with downland.

C. curtula L. (1966), *E. complana* L., *Euxoa tritici* L. (White Line Dart), *Noctua interjecta* Hübn., *Graphiphora augur* Fab., *Hadena compta* Schiff., *A. flavicincta*, *Naenia typica* L. (Gothic), *Apatele leporina* L. (Miller), *Apamea ypsilon* Schiff. (Dingy Shears), *P. umbra*, *R. lutosa*, the last two in 1966. *Sterrrha sylvestraria* Hübn. (Dotted Border Wave), 1966, with only one previous record, from Chislehurst. *Larentia clavaria* Haw. (Mallow) (1967), *Euphyia cuculata* Hufn. (Royal Mantle) (1966), *Chesias rufata* Fab. (Broom-tip) (1966), *Perizoma alchemillata* L. (Small Rivulet) (1966) all have few records for this area. *Sterrrha vulpinaria* H.-S. has colonised K.16, while among the bigger Geometers *Ennomos autumnaria* Wernb. has appeared regularly. A melanic *Lycia hirtaria* Clerck (Brindled Beauty) was noted in 1966.

SURREY (S.17)

Mr. B. R. STALLWOOD has observed that 1966 was the best of the two years at Chessington for butterflies, with several *V. cardui* and two *C. croceus* there in viii and ix, but only a single *C. argiolus* L. A few *P. aegeria* turned up there in ix and a number of *A. hyperanthus* in vii. *V. io* (Peacock) was fairly common there that season but more numerous in 1967 which saw quite an abundance of *A. urticae* in late summer. *V. atalanta* was relatively scarce both years, but *Thymelicus lineola* was comparatively numerous in both seasons.

Dr. IAN MENZIES reports *Cupido minimum* Fuessl. (Small Blue) abundant still on Banstead Downs, also *Plebeius argus* L. (Silver-studded Blue) plentiful both years on Ockham and Fairmile Commons. Bookham Common provided quite a number of *Limenitis camilla* L. (White Admiral) while on Ranmore Common *Lysandra bellargus* Rott. (Adonis Blue) was still holding its own.

Mr. G. H. GUSH has sent in a number of special records made near Thorpe and Weybridge. The most surprising of these was *Argynnis paphia* L. (Silver-washed Fritillary) near Thorpe on 17th July, 1967. In that year *V. atalanta* was seen there from May to September. In early September near Thorpe in 1966 he saw *L. camilla*, usually very scarce in this district, as well as *V. atalanta* and hundreds of *Plusia gamma* L. (Silver Y) later in the month. *Thecla quercus* L. (Purple Hair-streak), 23.vii.67, sunning itself on an oak bough, scarce around Thorpe. *Thymelicus sylvestris* Poda (Small Skipper) very common there in 1967. Round Weybridge, 1966: many *V. atalanta* and a few *V. cardui* in September; 1967: a few *Polygonia c-album* (Comma). He also reports the following moths during 1967:

Mormo maura L. (Old Lady) on the station wall at Weybridge. *Cerura vinula* L. (Puss Moth) at light at Thorpe, and three larvae from the Weybridge area, together with *Abraxas grossulariata* L. (Magpie), never numerous in that region; *Euchoeca nebulata* Scop. (Dingy Shell) and larvae of *Geometra papilionaria* L. (Large Emerald) both near Thorpe.

Prof. J. V. DACIE at his home at Wimbledon took the two migrants *Rhodomestra sacraria* L. (Vestal) in September, 1966 and in July of that year *Nycterosea obstipata* Fab. (Gem). Newcomers to his trap in 1967 included *Cirrhia gilvago* Esp. (Dusky Lemon Sallow), *Cosmia diffinis* L. (White-spotted Pinion) and *Sterrhia emarginata* L. (Small Scallop Wave). In July, 1967, he also took a second example of *Eupithecia millefoliata* Rössler (Yarrow Pug).

Mr. D. S. FLETCHER reports the capture at Warlingham in June, 1967, of an authentic *Procus versicolor* Borkh. (the Rufous Minor). This species is no doubt much more prevalent in the Area than the records show owing to its similarity to *P. strigilis* Clerck and *P. latruncula* Schiff.

Mr. DAVID TREMBATH, who lives near the southern boundary of the Area, at Reigate, records for 1966 his second *Apatete alni* L. (Alder Moth), also *Rhizedra lutosa* Hübn. (Large Wainscot) and another *Parascotia fuliginaria* L. (Waved Black) in July. *Aporophyla lutulenta* Schiff. (Deep Brown Dart) appeared in September. In 1967 he found *Aspitates gilvaria* Schiff. (Straw Belle) plentiful on the nearby downs.

Mr. C. B. ASHBY has submitted a very complete list of lepidoptera he has noted near his home at Cheam and also on Bookham Common. A notable species from the latter was *Odontosia carmelita* Esp. (Scarce Prominent) in April, 1966. *Arctia villica* L. (Cream-spot Tiger) was taken there in 1965, and *Asphalia diluta* Schiff. (Lesser Lute-string) in September of that year. *Orthosia advena* Schiff. (Northern Drab) appeared at Cheam in 1964 and *Cosmia diffinis* L. in 1965, both uncommon for the Area in

S.17. Both *Aporophyla nigra* Haw. (Black Rustic) and *A. lutulenta* Borkh. (Deep Brown Dart) were recorded at Cheam in 1966, a new locality for them in the Area. *Brachionycha sphinx* Hufn. (Sprawler) was seen in some numbers both in 1965 and 1966 at Bookham Common in late October. The two autumn species *Tiliacea citrigo* L. (Orange Sallow) and *T. aurago* Fab. (Barred Sallow) were taken in 1965 at Bookham Common, not noted in the 1954 survey, and the latter species was noted at Cheam in October of 1965 which saw several *Cirrhia gilvago* Esp. (Dusky Lemon Sallow) there. In 1965 there were three *Larentia clavaria* Haw. (Mallow) and in April, 1966, *Coenoteophria derivata* Schiff. (Streamer). Apparently all the *Biston betularia* L. (Peppered) taken at Cheam were of the melanic form *carbonaria*.

From Camberwell Mr. S. WAKELY records *Rhizedra lutosa* Hübn. in October, 1966, at rest on a bush in his garden there, a most unusual visitor for this part of the Area. He took an *N. obstipata* Fab. there on July 12th, 1967, as well as *Scopula promutata* Guen. (Mullein Wave) and *Euphyia unangulata* Haw. (Sharp-angled Carpet). The last species are also most unexpected in this region.

Reference has already been made to the abundance of *Celastrina argiolus* (Holly Blue) in 1966 at Carshalton and on Esher Common recorded (*Ent. Rec.*, 79: 23) by A. A. ALLEN.

Finally, for S.17 there has been found in collections specimens of *Amphipyra berbera* Rungs., *svenssoni* Fletcher (New Copper Underwing) from Egham (1872), Wimbledon (1875), Reigate (1886) and from near Epsom in more recent years.

BUCKS (B.24)

As before, SIR ERIC ANSORGE has sent in a most valuable list of further records from Chalfont St. Peter with several more species new to B.24. Among these during 1966 are **Harpyia furcula* L. (Sallow Kitten), **Tethea duplaris* L. (Lesser Lute-string), **Polia tinctoria* Brahm. (Silvery Arches) and most surprisingly **Parascotia fuliginaria* L. (Waved Black), an entirely new area for this elusive little moth. Another unlikely one for this locality was *Dicycla oo* L. (Heart Moth), with only one previous record.

Uncommon species for B.24 at Chalfont during 1967 included *Diacrisia sunnio* L. (Clouded Buff), *Amathes castanea* Esp. (Neglected Rustic), and *Sarothripus revayana* Scop. (Large Marbled Tortrix). All these were previously only reported from Black Park, Fulmer, in the middle of the last century and are new to the Chalfont list, as was **Lygephila pastinum* Treits. (Blackneck). Other captures of note included a melanic *Tethea ocellaris* L. (Figure of Eighty) and the black form of *Colocasia coryli* L. ab. *avellana* Hübn. (Nut-tree Tussock). There was also a remarkable aberration of *Petilampa minima* Haworth (Dotted Buff) in 1967. *Philereme vetulata* Schiff. (Brown Scallop), *Apeira syringaria* L. (Lilac Beauty) and *Ectropis extersaria* Hübn. (Brindled White-spot) were uncommon insects for the locality and for B.24. Among Sir Eric's earlier captures were two undoubted **A. berbera* Rungs., another addition to the County list.

As no analysis for the respective Vice-Counties has been made since the main work and supplements were finished in 1959, I have thought it of use and interest to renew this in the following table. Naturally the species for INNER LONDON have increased by far the most following the running of the mercury vapour moth-trap in the grounds of Buckingham Palace.

VICE-COUNTIES	I.L.	M.21	H.20	E.2.18	E.1.19	K.16	S.17	B.24	Totals for Area (1967)	U.K.
SPECIES OF BUTTERFLIES	24	49	47	51	25	53	54	31	59	76
MACRO-MOTHS	252	538	521	474	241	587	603	418	667	855
TOTALS	276	587	568	525	266	640	657	449	726	931
INCREASES SINCE 1959	53	3	16	26	1	11	7	29	8	25

REFERENCES

De Worms, C. G. M., 1966, *Lond. Nat.*, **45**: 89-97.

As will be noted, the total number of species of Macro-lepidoptera recorded for the London Area stands at 726 compared with 931 recognised species for the British Isles up to the end of 1967. This gives an overall percentage of 77.9 per cent. for the Area compared with 78.1 per cent. up to the end of 1965.

PROCEEDINGS

14th MARCH, 1968

The PRESIDENT, Mr. B. GOATER, B.Sc., F.R.E.S., in the Chair.

EXHIBITS

The President, specimens of *Eilema caniola* Hübn. and *Leucania putrescens* Hübn. from the cliffs at St. David's, Pembrokeshire, taken during August, 1967.

Mr. R. F. BRETHERTON, four species of Satyridae (Lep., Rhopalocera) from Cyprus, taken 13th/20th May, 1954: *Chazara briseis larnacana* Ob., including dimorphic females with white and orange markings respectively; *Hipparchia syriaca cypriaca* Stdgr.; *Pseudochazara amalthea acamanthis* Rebel; *Pararge roxelana* Cramer. The first three have endemic subspecies in Cyprus.

ANNOUNCEMENTS

The President welcomed Mr. D. LESTON to the meeting on behalf of members.

The President then called for members' appreciation of Mrs. Mere having donated £1,000 to enable the printing of Mr. G. Haggett's lepidopterous larvae plates.

COMMUNICATIONS

Dr. C. G. M. DE WORMS reported having already seen *Polyploca flavicornis* L. (Frosted Green), *Dichonia areola* Esp. (Early Grey), *Apocheima hispidaria* Schiff. (Small Brindled Beauty), and *Phigalia pilosaria* Schiff. (Pale Brindled Beauty), and *Erannis leucophaearia* Schiff.

(Spring Usher). He then referred to the President's exhibit of *E. caniola* and said that this species is found at Torquay, distributed over the Cornish peninsula and South Wales, it is also common on Anglesey. He commented that *Leucania putrescens* Hübn. was similarly distributed but not in N. Wales. *E. caniola* is also found in Eire. The President added that there are records from Rye and Mr. R. F. BRETHERTON mentioned Camber and Eastbourne, which Dr. De Worms confirmed.

Mr. R. W. J. Uffen reported a field meeting held in Singapore by Mr. E. Classey and Mr. C. G. Roche.

After the lecture, "Spring in Cyprus," by Dr. De Worms, the President closed the meeting.

28th MARCH, 1968

The PRESIDENT, Mr. B. GOATER, B.Sc., F.R.E.S., in the Chair

The President announced the deaths of Mrs. K. M. B. Tyler in November, 1967 and Mr. T. W. Tailby on 5th February, 1968.

EXHIBITS

The PRESIDENT—Two males and a female *Orthosia gothica* L., ab. *circumsignata* Hasebroek, the males taken by himself at Mill Hill, Middlesex, in 1956 and Bushey, Herts., 1965, and the female by Dr. A. Ridge at Huish Champflower, Som., in 1964. The ab. is a sterile double recessive.

Mr. J. A. C. GREENWOOD—Some full-grown larvae of *Angerona prunaria* L. (Orange Moth), from eggs laid by a female taken in Sussex, and approaching ab. *corylaria* Thunb. A book:—"Australian Butterflies" by I. F. B. Common which he presented to the Society's Library. A butterfly calendar from New Zealand.

COMMUNICATIONS

Mr. M. CLIFTON reported seeing *Gonepteryx rhamni* L. flying in the gardens of the British Museum (Nat. History).

Dr. C. DE WORMS said that he too had seen one in London. He then referred to the President's exhibit and quoted Mr. L. Goodson as saying that this form is exceptionally uncommon. He also reported having seen on Chobham Common *Inachis io* L., *Polygonia c-album* L., *Aglais urticae* L., and *Gonepteryx rhamni* L. He added that Mr. Heslop had seen *Nymphalis polychloros* L. in the West, and that it seemed already to be a good year for *Biston strataria* Hufn.

The President reported *P.c-album* L. from Elstree and the Secretary said he had seen *A. urticae* that morning and *P.c-album* previously.

After some further discussion, Mr. G. PRIOR spoke on "The Preservation of Commons," after which the President closed the meeting.

11th APRIL, 1968

The PRESIDENT, Mr. B. GOATER, B.Sc., F.R.E.S., in the Chair

EXHIBITS

Mr. S. A. WILLIAMS—*Gyrohaena pseudonana* Stran. This interesting beetle is very similar to *G. nana* (Paykull) but differs in the shape of the penis and in the puncturation on the pronotum. This is the first British specimen, and was taken at Chippenham Fen in Sulphur-tuft fungus, *Hypholoma fasciculare* (Huds.).

A discussion was then opened by Mr. A. E. GARDNER and Mr. S. A. WILLIAMS on "Collecting Coleoptera" which was illustrated by colour slides and accompanied by demonstrations.

The President then closed the meeting.

25th APRIL, 1968

The PRESIDENT, Mr. B. GOATER, B.Sc., F.R.E.S., in the Chair

EXHIBITS

Mr. M. CLIFTON—Two specimens of *Brochymena quadripus tulata* Fabr. and *B. arborea* Say. (Hem.), both from Powdermill Nature Reserve, Pennsylvania, taken in autumn 1966. Both are widespread in the United States and Canada and although plant-feeders, have been recorded as occasionally feeding on soft-bodied larvae.

A Chalcid (Hym.) from a pupa of *Opsiphanes* sp., one of the owl butterflies, from Rio de Janeiro, Brazil. It has been identified as *Spilochalcis* sp. 27 females and one male of the parasite emerged at the British Museum on the 19th of April, 1968.

A part of the newspaper, "The Pittsburgh Press," giving a description of a bug being used in the Viet-Nam war to detect approaching enemies.

A specimen of lava from Mt. Etna, Sicily.

Mr. E. S. BRADFORD—a larva of (?) *Heliothis armigera* discovered when cutting open a tomato bought recently in Borehamwood.

COMMUNICATIONS

Dr. A. H. B. RYDON reported a cuckoo, a nightingale, swallows and a swift from Chailey in Sussex.

The President mentioned an article in the "Daily Telegraph" that reported the Little Swift from Cape Clear in Eire. This is the first British record. He added that he had recently seen an avocet on the Norfolk coast.

Mr. A. E. GARDNER reported a cuckoo in Wye; and also, in Suffolk, an avocet, swallows, bearded tits and cross-bills.

A discussion on cuckoos followed.

Mr. R. W. J. UFFEN reported that the wild part of Ditchling Common had been burnt flat by someone who was using the common for farming purposes and not consulting the Common Committee. This is an area of scientific interest.

Dr. RYDON said that the Sussex Naturalists' Trust might help, as they had done for Chailey Common. The President said that he would write to them or to the Nature Conservancy.

Colour transparencies were then shewn by the following members: Mr. CLIFTON; Mr. HAMMOND; Mr. UFFEN; Mr. WILTSHIRE; and Mr. BRADFORD.

The President then closed the meeting.

9th MAY, 1968

The PRESIDENT in the Chair

Mr. T. G. Howarth reported the death of Dr. R. M. Fox of Carnegie Museum, Penn., U.S.A.

EXHIBITS

Mr. D. O'KEEFE—*Coenophila subrosea* Steph. (Lep., Noctuidae) (The Rosy Marsh Moth) larvae, a joint exhibit with R. G. CHATELAIN and B. F. SKINNER; found at night feeding on *Myrica gale* (Bog Myrtle) in Wales. In two and a half hours' collecting over a hundred larvae were seen, all being between a quarter and half grown. In confinement they had taken readily to feeding on *Salix* (willow) species.

Mr. C. O. HAMMOND—*Bombylius discolor* Mikan (Dipt.) (the Bumble Bee Fly) taken at Windsor Forest on 22nd April, 1951, and taken there again by Mr. A. E. Stubbs on 20th April, 1968.

Mr. M. P. CLIFTON—Four larvae of *Lymantria dispar* L., the Gipsy Moth, in their penultimate larval stage.

Mr. J. A. C. GREENWOOD—A colour photograph of the flowers of *Lathraea clandestina*, a broom-rape or toothwort, growing in a Kentish garden. In that area there were a number of plants growing, and flowering was continuing having started in February. Mr. Greenwood asked whether the plant was parasitic on Rhododendrons.

Mr. A. E. GARDNER—The following rare and local species of Col., Carabidae:—(a) *Bembidion fumigatum* (Duft.) a series from reed refuse at Cley, Norfolk, 13th April, 1968; (b) *Bembidion clarki* Dawson, a series from tufting at Chislehurst Common, Kent, 24th March, 1968; (c) *Codes helopiodes* (F.) Lymington Marsh, Hants., 4th May, 1968; and (d) *Pterostichus anthracinus* (Ill.), Cley, Norfolk, 13th April, 1968.

The President said that he had had a letter from Mr. Uffen about Ditchling Common and had written to Sussex Naturalists' Trust and sent a copy of his letter to the Nature Conservancy.

ANNOUNCEMENTS

The President then announced that since Mr. Buck's resignation, Mr. E. P. Wiltshire had kindly agreed to take over the post of Hon. Editor. Mr. Wiltshire asked members to note that his address was now: 140 Marsham Court, Marsham Street, London, S.W.1, and not in Berkshire as given in the List of Members.

DISCUSSION ON EXHIBITS

The President congratulated Messrs. Chatelain, Skinner and O'Keefe on finding the larvae of *Coenophila subrosea* which must be the first ones seen in the British Isles for about a century.

Mr. T. R. EAGLES confirmed the name of Mr. Greenwood's exhibit and said that his own specimens grew on willow (*Salix caprea*) and that he had not heard of it growing on rhododendron.

After the lecture by Dr. C. A. CLARKE on "Hybrid Swallowtails and some observations on mimicry," the President closed the meeting.

23rd MAY, 1968

The PRESIDENT in the Chair

EXHIBITS

Mr. T. R. EAGLES on behalf of Dr. P. J. L. ROCHE, a transparency of a stinkhorn fungus probably a variety of *Phallus indusiatus* from primary

forest, Sabah, Malaysia. When growing the fish-net skirt was rose pink, but it later turned white. 14th April, 1968.

Mr. C. O. HAMMOND some Diptera taken at Cosford Mill Field Meeting on 19th May, 1968.

Criorhina berberina, Fab. and its variety *oxycanthae*, Meigen. previously considered a separate species; both are mimics of Bumble Bees.

Sericomyia lappona, L. a Honey Bee mimic.

Chrysotoxum cautum, Harris, a Wasp mimic.

Mr. S. A. WILLIAMS, a book published to celebrate the centenary of the Folkestone Natural History Society. He presented the book, "Some aspects of the Natural History of the Folkestone District" to the Society's library.

Mr. A. E. GARDNER, the following Coleoptera, Scydmaenidae:—

Stenichnus godarti (Latr.). Two specimens of this rare species found in the nests of the ant *Formica rufa* L., New Forest, Hants., 7th April, 1968, and 5th May, 1968.

Stenichnus collaris (Müll.). Two specimens found in *F. rufa* nests with the above species, 5th May, 1968. This does not appear to be one of the myrmecophilous species.

Stenichnus exilis (Erichs.). One specimen of this rare myrmecophilous species found under freshly cut oak planks, New Forest, 22nd October, 1967.

Dr. C. G. de WORMS fully fed larvae of *Polia xanthomista* bred from eggs.

Mr. C. F. DEWHURST two specimens (mature female and a nymph) of a Praying Mantis (*Acanthops tessellata*, subject to confirmation) taken at night in a forest clearing in the Matto Grosso, Lat. 12° 51' South, Long. 51° 46' West, by Dr. M. J. Richards of the Royal Society expedition earlier this year. The nymph was one of 12 so far hatched from three egg pods laid by the female.

MATTERS ARISING

Mr. J. A. C. GREENWOOD said that he had spoken to Lord Aberconway regarding the Broomrape growing in a Kentish garden, who said that it is parasitic on Sallow.

Mr. Greenwood then asked if the Broomrape in question might be another species as there is no Sallow on the ground where it occurs.

ANNOUNCEMENTS

The President announced that the Nature Conservancy had asked for records from Ashenbank Wood, near Cobham, Kent, particularly of Coleoptera and Hemiptera, details to be sent to Mr. Labern.

COMMUNICATIONS

Dr. de WORMS reported seeing Orange Tips and three species of Whites that morning. He also reported the Pearl Bordered Fritillary from the New Forest.

The President said that his M.V. trap results were very poor.

The Secretary added that it had been a poor year generally so far and he had seen only small numbers of Hemiptera.

Mr. R. F. BRETHERTON remarked that he had had 66 species in his M.V. trap to date and that about two-thirds of these were one species, the remainder being ones and twos of other species.

Dr. de WORMS commented that he had a Cinnabar moth last week.

After the lecture on "The Metamorphosis of *Papilio ajax*" by Mrs. G. F. Brewer, the President closed the meeting.

PAST PRESIDENTS

1872-4	J. R. WELLMAN (dec.).	1932	T. H. L. GROSVENOR, F.E.S. (dec.).
1875-6	A. B. FARN, F.E.S. (dec.).	1933	C. G. M. DE WORMS, M.A., PH.D., A.I.C., F.R.E.S., M.B.O.U.
1877	J. P. BARRETT, F.E.S. (dec.).	1934	T. R. EAGLES.
1878	J. T. WILLIAMS (dec.).	1935	E. E. SYMS, F.R.E.S.
1879	R. STANDEN, F.E.S. (dec.).	1936	M. NIBLETT.
1880	A. FICKLIN (dec.).	1937	F. J. COULSON.
1881	V. R. PERKINS, F.E.S. (dec.).	1938	F. STANLEY-SMITH, F.R.E.S.
1882	T. R. BILLUPS, F.E.S. (dec.).	1939	H. B. WILLIAMS, LL.D., F.R.E.S.
1883	J. R. WELLMAN (dec.).	1940	E. A. COCKAYNE, D.M., F.R.C.P., F.R.E.S. (dec.).
1884	W. WEST, L.D.S. (dec.).	1941	F. D. COOTE, F.R.E.S. (dec.).
1885	R. SOUTH, F.E.S. (dec.).	1942	S. WAKELY.
1886-7	R. ADKIN, F.E.S. (dec.).	1943	R. J. BURTON, L.D.S., R.C.S.ENG.
1888-9	T. R. BILLUPS, F.E.S. (dec.).	1944	STANLEY N. A. JACOBS, S.B.ST.J., F.R.E.S.
1890	J. T. CARRINGTON, F.L.S. (dec.).	1945-6	Capt. R. A. JACKSON, R.N., F.R.E.S.
1891	W. H. TUGWELL, PH.C. (dec.).	1947	L. T. FORD, B.A. (dec.).
1892	C. G. BARRETT, F.E.S. (dec.).	1948	Col. P. A. CARDEW (dec.).
1893	J. J. WEIR, F.L.S., etc. (dec.).	1949	J. O. T. HOWARD, M.A. (dec.).
1894	E. STEP, F.L.S. (dec.).	1950	Air-Marsh. Sir ROBERT SAUNDBY, K.B.E., C.B., M.C., D.F.C., A.F.C., F.R.E.S.
1895	T. W. HALL, F.E.S. (dec.).	1951	T. G. HOWARTH, B.E.M., F.R.E.S., F.Z.S.
1896	R. SOUTH, F.E.S. (dec.).	1952	E. W. CLASSEY, F.R.E.S.
1897	R. ADKIN, F.E.S. (dec.).	1953	F. STANLEY-SMITH, F.R.E.S.
1898	J. W. TUTT, F.E.S. (dec.).	1954	STANLEY N. A. JACOBS, S.B.ST.J., F.R.E.S.
1899	A. HARRISON, F.L.S. (dec.).	1955	F. D. BUCK, A.M.I.P.T.G.M., F.R.E.S.
1900	W. J. LUCAS, B.A., F.E.S. (dec.).	1956	Lt.-Col. W. B. L. MANLEY, F.R.E.S.
1901	H. S. FREMLIN, M.R.C.S., L.R.C.P., F.E.S. (dec.).	1957	B. P. MOORE, B.S.C., D.PHIL., F.R.E.S.
1902	F. NOAD CLARK (dec.).	1958	N. E. HICKIN, PH.D., B.S.C., F.R.E.S.
1903	E. STEP, F.L.S. (dec.).	1959	F. T. VALLINS, A.C.I.I., F.R.E.S.
1904	A. SICH, F.E.S. (dec.).	1960	R. M. MERE, F.R.E.S. (dec.).
1905	H. MAIN, B.S.C., F.E.S. (dec.).	1961	A. M. MASSEE, O.B.E., D.S.C., F.R.E.S.
1906-7	R. ADKIN, F.E.S. (dec.).	1962	A. E. GARDNER, F.R.E.S.
1908-9	A. SICH, F.E.S. (dec.).	1963	J. L. MESSENGER, B.A., F.R.E.S.
1910-11	W. J. KAYE, F.E.S.	1964	C. G. ROCHE, F.C.A., F.R.E.S.
1912-13	A. E. TONGE, F.E.S. (dec.).	1965	R. W. J. UFFEN, F.R.E.S.
1914-15	B. H. SMITH, B.A., F.E.S. (dec.).	1966	J. H. C. GREENWOOD, O.B.E., F.R.E.S.
1916-17	Hy. J. TURNER, F.E.S. (dec.).	1967	R. F. BRETHERTON, C.B., M.A., F.R.E.S.
1918-19	STANLEY EDWARDS, F.L.S., etc. (dec.).	1968	B. GOATER, B.S.C., F.R.E.S.
1920-1	K. G. BLAIR, B.S.C., F.E.S. (dec.).		
1922	E. J. BUNNETT, M.A. (dec.).		
1923-4	N. D. RILEY, F.Z.S., F.E.S.		
1925-6	T. H. L. GROSVENOR, F.E.S. (dec.).		
1927-8	E. A. COCKAYNE, D.M., F.R.C.P., F.E.S. (dec.).		
1929	H. W. ANDREWS, F.E.S. (dec.).		
1930	F. B. CARR (dec.).		
1930	C. N. HAWKINS, F.E.S.		
1931	K. G. BLAIR, B.S.C., F.Z.S., F.E.S. (dec.).		

The Society's Publications

Back numbers of the Society's Publications still in print are becoming scarce. We regret therefore that we have had to reassess their value and new prices have been agreed. These are as follows:—

	£	s.	d.		£	s.	d.		£	s.	d.
1919-20	1	0	0	1935-36	1	10	0	1955	2	10	0
1922-23	1	10	0	1936-37	1	10	0	1956	2	10	0
1923-24	1	10	0	1937-38	2	0	0*	1957	3	0	0*
1924-25	1	10	0	1945-46	2	0	0*	1958	2	10	0
1925-26	1	10	0	1946-47	2	10	0*	1959	2	10	0
1927-28	2	0	0*	1947-48	3	0	0*	1960	2	10	0
1928-29	2	0	0*	1948-49	3	0	0*	1961	2	10	0
1929-30	2	0	0	1949-50	3	0	0*	1962	2	10	0
1930-31	1	10	0*	1950-51	1	10	0	1963, Part 1	0	18	0
1931-32	2	0	0	1951-52	3	0	0*	1963, Part 2	1	0	0
1932-33	1	10	0	1952-53	3	0	0*	1964	0	10	6
1933-34	1	10	0	1953-54	1	10	0	1965	1	4	0
1934-35	1	10	0	1954-55	3	0	0*	1966	1	3	6
								1968	1	4	0

All other numbers are out of print, but when available mint or 1st Class secondhand 4 0 0

Other secondhand copies when available according to condition.

* These copies are very scarce and contain papers in great demand. Member's discount cannot therefore be allowed.

A GUIDE TO THE SMALLER BRITISH LEPIDOPTERA

by L. T. FORD, B.A.

This important work on the British Microlepidoptera is still available.

25/0

SUPPLEMENT TO THE GUIDE TO THE SMALLER BRITISH LEPIDOPTERA

by L. T. FORD, B.A.

Printed on one side of the page only so that it can be cut up and inserted into the correct place in the Guide.

4/0

A CATALOGUE OF BOOKS IN THE LIBRARY OF THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY

Compiled by T. R. EAGLES and F. T. VALLINS

2/6

THE NATURAL HISTORY OF THE GARDEN OF BUCKINGHAM PALACE

(Proceedings and Transactions 1963, Part 2)

Compiled by a team of specialists.

Price 20/0

CONTENTS

Current Literature	109
Haggett, G. M. , Larvae of the British Lepidoptera not figured by Buckler, Part VIII	57
Howarth, T. G. , <i>N. antiopa</i> L. in Oxford	112
Howarth, T. G. , <i>N. antiopa</i> L. in Surrey	112
Past Presidents	128
Proceedings	123
Spreadbury, W. H. , <i>D. plexippus</i> L. in Sussex	112
Worms, C. G. M. de , A review of the Macro-Lepidoptera of the London Area for 1966 and 1967	113

INDEX FOR 1968

It does not follow that because a page is referred to once only that there is not more than one entry

- Butterflies of Britain in Relation to those of Adjacent Parts of the Continent—
R. F. Bretherton, 7
- Council's Report 1967, 15
- Curator's Report 1967, 23
- Current Literature, 33
- dimorphism, 25
- Larvae of the British Lepidoptera not figured by Buckler, Part VIII—
G. M. Haggett, 57
- Librarian's Report 1967, 24
- List of Berkshire Psocoptera—T. R. New, 42
- Millipede, *Polyxenus lagurus* (L.), in Aberdeenshire, The—G. D. Morison, 36
- On a collection of *Zygaena* Fabricius (Lep., Zygaenidae) from Turkey—
W. G. Tremewan, 54
- Proceedings, 24, 123
- Special Meetings, 27
- Studies in the geography of Lepidoptera, VIII: a few notes on the ecology and
distribution of Zygaenidae in the Middle East—E. P. Wiltshire, 47
- Some Remarks on Diptera and their Prey—L. Parmenter, 37
- Treasurer's Report, 17
- Field Meeting, Oxshott, Surrey, 32

EXHIBITORS AND
CONTRIBUTORS

Batten, A. G. M., 25
 Beamish, H. H., 31
 Bradford, E. S., 125
 Bretherton, R. F., 4, 31, 123, 128
 Brewer, G. F., 128
 Chanter, D., 26
 Chatelain, R. G., 126
 Clarke, C. A., 126
 Clifton, M., 26, 124, 125, 126
 Crow, P. N., 25
 Dewhurst, C. F., 127
 Eagles, T. R., 32, 126
 Gardner, A. E., 25, 31, 125, 126, 127
 Goater, B., 26, 123, 124, 125
 Greenwood, J. A. C., 124, 126, 127
 Haggett, G. M., 57
 Hammond, C. O., 125, 126, 127
 Holland, P. C., 32
 Holloway, J. D., 26
 Homer, T. J. G., 29
 Howarth, T. G., 26, 112
 Jacobs, S. N. A., 30, 31
 MacKechnie Jarvis, C., 28, 30
 Morison, G. D., 36
 Morris, M. G., 31
 New, T. R., 42
 Newton, J. L., 26
 O'Keefe, D., 126
 Parmenter, L., 37
 Prior, G., 25, 124
 Roche, P. J. L., 126
 Rydon, A. H. B., 125
 Skinner, B. F., 126
 Spreadbury, W. H., 112
 Stubbs, A. E., 25, 29, 31
 Tremewan, W. G., 54
 Uffen, R. W. J., 125
 Vallins, F. T., 33
 Williams, S. A., 26, 124, 125, 127
 Wiltshire, E. P., 25, 30, 31, 47, 125
 Worms, C. G. M. de, 30, 31, 113, 123, 124, 127, 128

BIRDS

Avocet, 125
 Cuckoo, 125
 Little Swift, 125
 Nightingale, 125
 Robin, 30
 Swallow, 125

COLEOPTERA

anthracinus, Pterostichus, 126
 brunneus, Colon, 25
 clarki, Bembidion, 126
 collaris, Stenichnus, 127
 dispar, Thanatophilus, 30
 exilis, Stenichnus, 127
 fennicum, Lathrobium (Tetartopeus), 28

fumigatum, Bembidion, 126
 godarti, Stenichnus, 127
 helopiodes, Codes, 126
 maculicornis, Phyllobius, 38
 mortisaga, Blaps, 26
 mucronata, Blaps, 26
 nana, Gyrophaena, 124
 pagana, Atheta (Liogluta), 26
 pilicornis, Atheta (Tetropia), 26
 pseudonana, Gyrophaena, 124
 puberula, Haploanea (Phyllodrepa), 26
 quadratum, Lathrobium, 28
 serripes, Colon, 25
 uncinatus, Otiorrhynchus, 31

DICTYOPTERA

Praying Mantis, 127
 tessellata, Acanthops, 127

DIPTERA

aestiva, Empis, 39
 albiceps, Philonicus, 38
 albitarsis, Cheilosia, 39
 albolineata, Pseudomorellia, 38
 Asilidae, 37, 38, 41
 atra, Rhamphomyia, 40
 atricapilla, Dioctria, 38
 atricapillus, Machimus, 38
 aureus, Chrysopilus, 29
 auricollis, Syrphus, 38
 autumnalis, Musca, 38
 baumhaueri, Dioctria, 38
 berberina, Criorhina, 127
 brassicae, Erioischia, 38, 39
 carbonaria, Sciara, 38
 carnaria, Sarcophaga, 38
 cautum, Chrysotoxum, 127
 Chironomus, 39
 chorea, Lonchaea, 39
 ciliata, Hydrotaenia, 39
 cilicrura, Delia, 39
 cinctus, Lasiopogon, 38
 cingulatus, Epitriptus, 38
 citrofasciatum, Xanthogramma, 40
 cristatus, Chrysopilus, 29
 cyanurus, Neoitamus, 38
 digramma, Empis, 39
 discolor, Bombylius, 126
 discreta, Botamophila, 39
 dissecta, Nupedia, 39
 Dolichopodidae, 37
 Empidae, 37, 39, 41
 erythrocephala, Calliphora, 38
 esuriens, Pegomyia, 39
 fasciata, Platypalpus, 38
 febrilis, Dilophus, 39, 40, 41
 femorata, Empis, 39, 41
 femoratus, Dilophus, 39
 flavidipennis, Pycnoglossa, 40
 floralis, Nemorella, 39

FLOWERING PLANTS

frit, *Oscinella*, 40
 fugax, *Pegohylemia*, 39
 glabra, *Madiza*, 40
 graminum, *Dorycera*, 39
 hircus, *Pogonota*, 31
 irritans, *Hydrotæna*, 38
 johannis, *Bibio*, 39, 40
 laetus, *Chrysophilus*, 29
 lappona, *Sericomyia*, 127
 lateralis, *Micropeza*, 31
 leucopterus, *Bibio*, 39
 lineata, *Knutsonia*, 31
 litorea, *Scatophaga*, 40
 livida, *Empis*, 39
 lunosa, *Collinellula*, 40
 lutularia, *Scatophaga*, 40
 maculicornis, *S. auricollis*, var., 38
 maculipes, *S. lutulana*, var., 40
 marci, *Bibio*, 39, 41
 maritima, *Machaerium*, 40
 melanocerus, *Tipula*, 31
 mellinum, *Melanostoma*, 39
 mollissima, *Coelomyia*, 40
 Morellia, 39
 Muscidae, 37, 40, 41
 neilsei, *Erioptera*, 31
 nervosa, *Lipsothrix*, 25
 nigripes, *Rhamphomyia*, 40
 nigriventris, *Bibio*, 38
 nigriventris, *Sarcophaga*, 40
 nodulosa, *Ormisia*, 40
 obscura, *Phocera*, 39
 obscura, *Ptiolina*, 40
 occulta, *Hydrotæna*, 39
 oceanus, *Hydrophorus*, 40
 ostinorum, *Ceratinostoma*, 40
 pipiens, *Syrphus*, 40
 pomonae, *Bibio*, 39
 prunicana, *Apotomis*, 40
 punctata, *Empis*, 39
 putris, *Themira*, 38
 quadrivittata, *Hilara*, 40
 ribesii, *Syrphus*, 40
 rondanii, *Fannia*, 39
 rufipes, *Dioctria*, 38
 Scatophagidae, 37, 40, 41
 Sciara, 40
 scolopacea, *Rhagio*, 40
 scutellata, *Empis*, 40
 serena, *Fannia*, 39, 40
 siberita, *Prosenia*, 38
 sociella, *Fannia*, 39
 squalens, *Limnophila*, 31
 stercoraria, *Scatophaga*, 40, 41
 sulcata, *Rhamphomyia*, 40
 tarsalis, *Platycheirus*, 40
 tarsata, *Rhamphomyia*, 40
 teretirostris, *Sarcophaga*, 38
 tessellata, *Empis*, 39, 41
 tigrina, *Coenosia*, 40, 41
 trichodactyla, *Delia*, 39, 40
 turcica, *Prionocera*, 31
 umbratica, *Hebecnema*, 40
 variabilis, *Rhamphomyia*, 40
 vernalis, *Tipula*, 40
 vetula, *Phryno*, 40
 vulgaris, *S. carnaria*, var., 38

absinthium, *Artemisia*, 80
 Achillea, 80
 Agropyron, 71
 album, *Viscum*, 25
 Amygdalis, 39
 Angelica, 101
 angustifolium, *Chamaenerion*, 96
 annua, *Poa*, 57, 58, 66, 67, 69, 71
 Anthemis, 80
 Anthriscus, 99, 100
 aparine, *Galium*, 89
 Arbutus, 85
 aspen, 76, 78
 azarolae, *Crataegum*, 48, 49
 barbaratus, *Dianthus*, 63
 Betula, 32, 116
 Bilberry, 117
 Birch, 36, 37, 109, 116
 Bog Myrtle, 109, 126
 Broom, 118
 Broomrape, 127
 Buxus, 46
 Calluna, 72, 73, 83, 99, 109
 capensis (fulva), *Impatiens*, 90, 91, 92
 caprea, *Salix*, 126
 chrysanthemum, 58, 61
 Cistus, 85
 clandestina, *Lathraea*, 126
 cocciferae, *Quercetum*, 48
 Common Oak, 85
 communis, *Juniperus*, 104
 cordata (parvifolia), *Tilia*, 106, 107
 Cork Oak, 85
 Couch Grass, 71
 Crataegus, 43, 44, 45, 46
 Cupressus, 94
 Cypress, 74, 102, 104, 105
 Dactylis, 70, 71
 Dock, 62
 Douglas Fir, 37, 94
 Erica, 109
 Euphrasia, 97, 98
 europaea (vulgaris), *Tilia*, 106, 107, 108
 Evergreen Oak, 85
 Eyebright, 97
 Fagus, 44, 46
 fasciculifolius, *Astragalus*, 49
 fulva (= capensis), *Impatiens*, 90
 gale, *Myrica*, 126
 Golden Rod, 99
 Gorse, 109
 grandis, *Abies*, 93
 groundnut, 59
 guava, 60
 hawthorn, 25, 36, 100, 101, 109
 herba-alba, *Artemisia*, 49
 Holm Oak, 86
 Hypericum, 87
 Ilex, 45, 46
 ilex, *Quercus*, 85, 86
 inflata, *Silene*, 63, 64, 65
 Juniper, 74, 104
 Knotgrass, 83
 Kuerboom, 31
 Larch, 43, 94

Larix, 43, 44, 45
 lawsoniana, Chamaecyparis, 103
 Lawson's Cypress, 103
 lentiscae, Pistacietum, 48
 Lime, 105, 106
 Luccombe Oak, 85
 lusitanicae, Quercetum, 49
 Lychnis, 64, 99
 macrocarpa, Cupressus, 74, 76, 94,
 102, 104
 maritima, Artemisia, 80
 maritima, Silene, 64, 65
 Marsh Bedstraw, 89, 90
 Mediterranean Cypress, 102
 menziesii, Pseudotsuga, 37
 millefolium, Achillea, 81
 Mistletoe, 25
 Molinia, 32
 monogyna, Crataegus, 25
 montanum, Epilobium, 96
 Monterey Cypress, 102
 muticae, Pistacietum, 49
 Myrtus, 85
 nobilis, Abies, 93
 noli-me-tangere, Impatiens, 90
 normanniana, Abies, 93
 Norway Spruce, 93, 94
 nutans, Silene, 64
 oak, 43, 44, 46, 85
 officinalis, Euphrasia, 97, 99
 Ononis, 78
 orientalis, Fagetum, 49
 oroboides, Virgilia, 31
 otites, Silene, 64
 palustre, Galium, 89, 90
 Papilionaceae, 52
 parviflora, Impatiens, 91
 parvifolia (= cordata), Tilia, 106
 pectinata, Abies, 93
 persicae, Quercetum, 49
 Phyllyrea, 85
 pine, 36, 37, 94
 Pinus, 44
 Pistacea, 49
 plantain, 83
 platyphyllos, Tilia, 105, 106
 poplar, 60
 Poterietum, 49
 Poterium, 80
 Prunus, 49, 52, 100
 pulchrum, Hypericum, 87
 Pyrethrum, 80
 Quercus, 44, 45, 46
 repens, Ononis, 80
 robur, Quercus, 85
 Rosaceae, 52
 Rumex, 62
 rust, 32
 St. John's Wort, 87
 salisburgensis, Euphrasia, 97, 99
 Salix, 126
 Sallow, 99, 109, 127
 Salvia, 83
 Santolina, 80
 Sarothamnus, 44, 45, 46
 saxatile, Galium, 89
 sempervirens, Cupressus, 102

Silene, 64
 Silver Fir, 93, 94
 sitchensis, Picea, 93
 Sitka Spruce, 93, 94
 Sloe, 46
 Solidago, 99, 100
 spinosae, Zilletum, 48
 spinosi, Poterietum, 48
 Spiraea, 100
 Spruce, 94
 suber, Quercus, 85
 Sweet William, 63
 Tamarisk, 105
 Tanacetum, 80
 Taxus, 43, 44, 45, 46
 teak, 60
 tetragonum, Epilobium, 96, 97
 tetralix, Erica, 109
 Thuya, 60, 94
 tournefortii, Gundelia, 49
 Traveller's Joy, 117
 tremula, Populus, 76
 Ulmus, 44, 46
 Vaccinium, 117
 villosae, Calycotometum, 48
 vine, 52
 vitalba, Clematis, 117
 Vitis, 52
 wheat, 60
 Wild Almond, 49
 willow, 76, 126
 Yarrow, 81, 82
 Yew, 94
 Zygophylletum, 48

FUNGI

Agaricales, 32
 amethystea, Laccaria, 32
 androsaceus, Marasmius, 33
 annosum, Heterobasidion (Fomes), 32
 Aphyllophorales, 32
 argillacea, Clavaria, 32
 argillacea, Cribraria, 32
 Ascomycetes, 32
 atropurpurea, Russula, 33
 atrotomentosus, Paxillus, 33
 aurantia, Aleuria, 32
 aurantiaca, Cribraria, 32
 aurantiaca, Hygrophoropsis, 32
 aurantium, Scleroderma, 33
 badia, Peziza, 32
 badius, Boletus, 32
 betulinum, Melampsoridium, 32
 betulinus, Polyporus, 32
 chrysosperma, Apiocrea, 32
 citrina, Amanita, 32
 clavipes, Clitocybe, 32
 crispa, Sparassis, 32
 cristuliforme, Hebeloma, 32
 deliciosa, Lactarius, 32
 deliquescens, Dacrymyces, 32
 edulis, Boletus, 32
 emetica, Russula, 33
 epidendrum, Lycogala, 32
 epipterigia, Mycena, 33

excipuliformis, Calvatia, 33
 fasciculare, Hypholoma, 32, 124
 ferruginosa, Tubifera, 32
 flava, *F. septica* var., 32
 fragilis, Leocarpus, 32
 fragilis, Russula, 33
 fulva, Amanita, 32
 galericulata, Mycena, 33
 galopus, Mycena, 33
 Gasteromycetes, 33
 gelatinosum, Pseudohydnum, 32
 glaucopus, Cortinarius, 32
 hemitrichus, Cortinarius, 32
 Heterobasidiomycetes, 32
 hirsutum, Stereum, 32
 Homobasidiomycetes, 32
 Hypomyces, 32
 hypoxylon, Xylosphaera, 32
 indusiatus, Phallus, 126
 involutus, Paxillus, 33
 laccata, Laccaria, 32
 leucogala, Mycena, 33
 lutea, Russula, 33
 maculata, Collybia, 32
 melanospermum, Didymium, 32
 muscaria, Amanita, 32
 myxomycetes, 32
 nigripes, Didymium, 32
 ochroleuca, Russula, 33
 penetrans, Gymnopilus, 32
 perennis, Coltrichia (Polystictus), 32
 peronata, Collybia, 32
 pubescens, Lactarius, 32
 purpurea, Claviceps, 32
 quietus, Lactarius, 33
 roseus, Gomphidius, 32
 rubescens, Amanita, 32
 rufus, Lactarius, 33
 rutilans, Tricholomopsis, 33
 sanguinolenta, Mycena, 33
 sarcoides, Coryne, 32
 scaber, Boletus, 32
 semisanguineus, Cortinarius, 32
 septica, Fuligo, 32
 staurospora, Nolanea, 33
 Stinkhorn, 126
 terrestris, Thelephora, 32
 testaceosaber, Boletus, 32
 tremellosus, Merulius, 32
 turpis, Lactarius, 33
 variegatus, Boletus, 32
 versicolor, Corilus (Polystictus), 32
 vietus, Lactarius, 33
 viscosa, Calocera, 32

HEMIPTERA

arborea, Brachymena, 125
 aurita, Ledra, 25
 quadripus, Brachymena, 125
 tulata, B. quadripus, s.sp., 125

HYMENOPTERA

aquilina, Formica, 36
 bipartita, Pteronidea, 38

flavus, Lasius, 46
 rapae, Pachyprotasis, 38
 rufa, Formica, 127

LEPIDOPTERA

abrotani (artemisiae), Cucullia, 75
 absinthiata, Eupithecia, 99, 100, 101
 acaciae, Strymon, 14
 acamanthis, P. amalthaea, 123
 achine, Pararge, 14
 actaeon, Thymelicus, 10, 11, 13
 adippe, Fabriciana, 11, 13
 Adonis Blue, 9, 121
 adusta, Eumichtis, 117, 119
 advena, Orthosia, 120, 121
 aegeria, Pararge, 116, 117, 119, 120
 aestiva, E. biriviata, f., 9
 aethiops, Erebia, 9, 11, 13
 agestis, Aricia, 7, 10, 13
 aglaia, Mesoacidalis, 13
 Agrumenia, 51, 52
 albimacula, Hadena, 64
 albulata, Perizoma, 97
 alceae, Careharodus, 11, 14
 alchemillata, Perizoma, 119, 120
 alcon, Maculinea, 10, 14
 alcyon, Hipparchia, 10, 15
 Alder Moth, 121
 alexanor, Papilio, 31
 alexis, Glaucopsyche, 10, 14
 allous, Aircia, 7, 9, 10, 11, 13
 almalthea, Pseudochazara, 123
 alni, Apatele, 121
 alternata, Epirrhoe, 90
 alveus, Pyrgus, 8, 14
 amandus, Lysandra, 14
 amasina, Z. carniolica, s.sp., 56
 Amathes, 60
 American Painted Lady, 8
 ampelophaga, Theresimima, 50, 53
 Amphipyridinae, 60
 anatolica, Procris, 53
 anatoliensis, Z. punctum, s.sp., 54
 anceps (= infesta), Apamea, 70–1
 andromedae, Pyrgus, 15
 anodoletia, Z. filipendulae, s.sp., 56
 anonyma, Limenitis, 14
 antiopa, Nymphalis, 4, 8, 10, 12, 13,
 112, 115, 116
 Apamea, 70
 Apatelinae, 60
 Aplasta, 80
 Apollo, 8
 apollo, Parnassius, 8, 14
 Aporophyla, 72
 araratensis, Zygaena, 55
 araxis, Z. manlia, s.sp., 52
 arcania, Cononympha, 10, 11, 14
 arceuthata, E. intricata, s.sp., 105
 areola, Dichonia, 123
 Argent and Sable, 118
 argiades, Everes, 11, 12, 14
 argiolus, Celastrina, 114, 117, 118, 120,
 122
 argiolus, Lycaenopsis, 13

- argus, *Plebejus*, 13, 121
 argyronomen, *Lycaeides*, 15
 arion, *Maculinea*, 9, 11, 13
 armigera, *Heliothis*, 125
 armoricanus, *Pyrgus*, 8, 10, 14
 Arran Brown, 8
 artaxerxes, *Agestis*, f., 7, 9
 artemisiae (= *arbrotoni*), *Cucullia*, 75
 assimilata, *Eupithecia*, 107
 atalanta, *Vanessa*, 8, 13, 113, 114, 116, 117, 120, 121
 athalia, *Melicta*, 13
 augur, *Graphiphora*, 120
 aurago, *Tiliacea*, 122
 aurinia, *Euphydryas*, 9, 13
 australia, *Aporophyla*, 72
 australis, *Colias*, 7, 8, 11, 12, 14
 Autumnal Carpet, 118
 autumnaria, *Ennomos*, 119, 120
 autumnata, *Oporinia*, 118
 avellana, *C. coryli* f., 122
 Balsam Carpet, 90–2
 Barred Red, 117
 Barred Sallow, 122
 barthai, *Z. purpuralis*, s.sp., 55
 basilinea (= *sordens*), *Apamea*, 70
 batavus, *L. dispar*, s.sp., 11
 Bath White, 8
 baton, *Philotes*, 14
 Beautiful Snout, 117
 belemia, *Euchloe*, 31
 bellargus, *Lysandra*, 9, 11, 13, 121
 berbera, *Amphipyra*, 115, 117, 118, 120, 122
 Berger's Clouded Yellow, 8
 betulae, *Thecla*, 13
 betularia, *Biston*, 25, 26, 119, 122
 bicruris, *Hallena*, 64
 bifasciata, *Perizoma*, 98
 binaria, *Drepana*, 116, 119
 biriviata, *Xanthorhoe*, 90–2, Pl. 5 (figs. 9–12), 14
 Black Hairstreak, 9
 Blackneck, 116, 199, 122
 Black Rustic, 122
 Black-Veined White, 8
 Blair's Mocha, 84–6
 blandiata, *Perizoma*, 98
 Blotched Emerald, 81
 Boeticus, *Lampides*, 8, 13, 114, 116
 bore, *Oenis*, 10, 14
 brandti, *Rhagades*, 49, 52, 53
 brassicae, *Pieris*, 13
 Brindled Beauty, 120
 briseis, *Chazara*, 123
 britannica, *T. variata*, s.sp., 93
 britannicus, *P. machaon*, s.sp., 9
 Broom-tip, 120
 Brown Argus, 7, 10
 Brown Scallop, 118, 122
 Brown-spot Pinion, 118
 Brown-tail, 114, 116
 Brown-veined Wainscot, 119
 Bullrush Wainscot, 118
 c-album, *Polygonia*, 124
 Camberwell Beauty, 4, 8, 10, 112, 115, 116
 cambysea, *Zygaena*, 49, 52
 camilla, *Limnitis*, 9, 13, 121
 canescens, *Polymixis*, 51
 caniola, *Eilema*, 123
 caniola, *Lithosia*, 124
 Caradrina, 115
 Caradrinidae, 60
 carbonaria, *B. betularia*, f., 119, 122
 cardamines, *Anthocaris*, 13, 116
 cardui, *Vanessa*, 8, 13, 113, 114, 116, 117, 118, 120
 carmelita, *Odontosia*, 121
 carniolica, *Zygaena*, 51, 52, 55
 carthami, *Pyrgus*, 14
 carueli, *L. dispar*, s.sp., 11
 castanea, *Amathes*, 122
 castigata, *Eupithecia*, 99, 101, 106
 centaureae, *Pyrgus*, 15
 centaureata, *Eupithecia*, 101
 cespitis, *Tholera*, 118
 Chalk-hill Blue, 9
 Chamomile Shark, 119
 chamomillae, *Cucullia*, 119
 chariclea, *Clossiana*, 10, 15
 charlonia, *Euchloe*, 30, 31, 51
 chirazica, *Zygaena*, 52
 chiron, *Eumedonia*, 15
 Chocolate Tip, 120
 chrysorrhoea, *Euproctis*, 114, 116, 119
 Cinnabar, 116, 128
 cinxia, *Melitaea*, 13
 circumsignata, *O. gothica*, ab. 124
 citrigo, *Tiliacea*, 118, 122
 clathrata, *Chiasmia*, 177
 clavaria, *Larentia*, 120, 122
 Clouded Buff, 122
 Clouded Yellow, 7, 8, 114
 c-nigrum, *Amathes*, 118
 Comma, 116, 121
 comma, *Hesperia*, 13
 Common Blue, 117
 complana, *Eilema*, 119, 120
 compta, *Hadena*, 63–4, Pl. 7 (figs. 8, 11, 12), 115, 119, 120
 conspersa, *Hadena*, 64–5, Pl. 7 (figs. 1–6)
 Copper Underwing, 115
 coridon, *Lysandra*, 9, 11, 13
 corycia, *Zygaena*, 52
 coryli, *Colocasia*, 120, 122
 corylata, *A. prunaria*, ab., 124
 Cosymbia, 86
 crataegi, *Aporia*, 8, 13
 Cream-spot Tiger, 119, 121
 cribrumalis, *Zanclognatha*, 119
 croceus, *Colias*, 8, 13, 114, 117, 118, 120
 cucubali (= *rivularis*), *Hadena*, 64
 cuculata, *Euphyia*, 120
 cucullatella, *Nola*, 116
 Cucullia, 75
 cucullina, *Lophopteryx*, 120
 curta, *Clostera*, 120
 cuvieri, *Zygaena*, 49, 50, 52
 Cypress Pug, 102–4
 cypriaca, *H. syriaca*, 123
 damon, *Agrodiaetus*, 14
 daplidice, *Pontia*, 8, 10, 11, 12, 13
 Dark Brocade, 117

- Dark Dagger, 117
 Dark Scallop, 118
 Dark Swordgrass, 120
 Deep Brown Dart, 121
 defoliaria, *Erannis*, 116
 derivata, *Coenotephia*, 122
 Devon Carpet, 88–90
 dia, *Clossiana*, 8, 11, 14
 diamina, *Melitaea*, 11, 14
Dianthoecia, 63, 64
 diaphana, *Zygaena*, 55
 didyma, *Melitaea*, 14
 diffinis, *Cosmia*, 121
 diluta, *Asphalia*, 121
 Dingy Shears, 120
 Dingy Shell, 121
 disa, *Erebica*, 15
 dispar, *Lycaena*, 8, 10, 11, 13
 dispar, *Lymantia*, 126
 dissoluta, *Nonagria*, 119
 distinctaria, *Bapta*, 119
 dorylas, *Lysandra*, 14
 Dotted Border Wave, 120
 Dotted Buff, 122
 Dotted Fanfoot, 119
 Dotted Rustic, 57–8
 dromedarius, *Notodonta*, 117
 Duke of Burgundy, 9
 duplaris, *Tethia*, 118, 122
 Dusky Lemon Sallow, 121, 122
 Dusky Sallow, 119
 Dusky Thorn, 117
 Early Grey, 123
 Eastern Tortoiseshell, 9
 efformata, *Anaitis*, 86–8, Pl. 6 (figs. 1–5)
 egenaria, *Eupithecia*, 105–8, Pl. 4 (figs. 9, 10, 12, 13)
 egeria, *Pararge*, 13
 elpenor, *Deilephila*, 118
 emarginata, *Sterrhia*, 121
 embla, *Erebica*, 15
 Emperor, 119
 epiphron, *Erebica*, 9, 11, 13
 erosaria, *Deuteronomos*, 117, 120
 Essex Emerald, 80–1
 Essex Skipper, 119
 eunioia, *Procllossiana*, 10, 14
 euphrosyne, *Clossiana*, 13
Eupithecia, 99, 110
 expallidata, *Eupithecia*, 99
 exsiccata, *Tathorrhynchus*, 114
 extensaria, *Ectropis*, 122
 fagata, *Operophtera*, 26
 fagi, *Hipparchia*, 14
 falloni, *Euchloe*, 31
 fasciaria (*prosapiaria*), *Ellopiia*, 117
 favicolor, *Hydraena*, 71
 Feathered Thorn, 118
 Fen Square Spot, 61–2
 Figure of Eighty, 120, 122
 filipendulae, *Zygaena*, 51, 53, 56, 118
 fibrialis, *Thalera*, 81–2, Pl. 3 (figs. 11–16)
 Five-spot Burnet, 118
 flava, *Adopoea*, 13
 flavicornis, *Polyplocia*, 123
 flavicincta Antitype, 119, 120
 flavivirens, *Caradrina*, 115, 117
 Fletcher's Pug, 105–8
 florida, *Diarsia*, 61–2, Pl. 7 (figs. 7, 9, 10), 71
 fluctuata, *Xanthorhoe*, 92
 fontis, *Bomolocha*, 117
 Four Spotted, 120
 freija, *Clossiana*, 15
 frigga, *Clossiana*, 15
 Frosted Green, 117, 123
 fuliginaria, *Parascotia*, 121, 122
 furuncula, *Harpypia*, 122
 furuncula, *Procus*, 69
 fuscantaria, *Deuteronomos*, 117
 galathea, *Malanargia*, 9, 11, 13
 gamma, *Plusia*, 121
 ganymedes, *Zygaena*, 55
 Gem, 115, 117, 118, 121
 Gipsy, 126
 gilvago, *Cirrhia*, 121, 122
 gilvaria, *Aspitates*, 121
 glandon, *Agriades*, 15
 Gold Swift, 114
 Golden Rod Pug, 99–101
 Gothic, 120
 gothica, *Orthosia*, 128
 graeca, *Procris*, 51, 53
 graslini, *Zygaena*, 48, 53
 Green-veined White, 116
 Grey Spruce Carpet, 92–5
 grossulariata, *Abraxas*, 12
 haematina, *Zygaena*, 49, 50, 52
 hafis, *Z. cambysea*, 52
 halterata, *Lobophora*, 119
 hastata, *Eulype*, 118
 haxs, *Z. cambysea*, 49
 Heart Moth, 122
 Heath Rivulet, 97–9
 hecla, *Colias*, 14
 hecta, *Hepialus*, 114, 116
 Hedge Brown, 9, 117
 Hedge Rustic, 118
 helle, *Lycaena*, 14
 hero, *Coenonympha*, 10, 14
 hesperica, *L. leautieri*, s.sp., 73
 hibernica, *E. intricata*, s.sp., 104–5, Pl. 4 (figs. 8 & 11)
 hippocastanaria, *Pachycnemis*, 117
 hippothoe, *Paleochrysophanus*, 10, 14
 hirtaria, *Lycia*, 120
 hispidaria, *Apocheima*, 123
 Holly Blue, 114, 117, 122
 Horse Chestnut, 117
 Hummingbird Hawk, 113
 huntera (= *virginiensis*), *Vanessa*, 7
 Hunter's Painted Lady, 7
 hyale, *Colias*, 7, 8, 13
Hydraena, 71
 hyperantus, *Aphantopus*, 13, 118, 120
 icarus, *Polyommatus*, 13, 117
 idas, *Lycaeides*, 10, 14
 iduna, *Euphydryas*, 10, 15
 ilia, *Apatura*, 14
 ilicis, *Strymon*, 14
 illiterata, *Z. carniolica*, s.sp., 52
 imitana, *Scopula*, 117

- immaculata, *Hemistola*, 82, 117
 immorata, *Scopula*, 82-4, Pl. 3 (figs. 7, 8, 10)
 improba, *Clossiana*, 10, 15
 infesta (anceps), *Apamea*, 70-1, Pl. 1 (figs. 4, 7, 8)
 ino *Brenthis*, 14
 interjecta, *Noctua*, 117, 119, 120
 intricata, *Eupithecia*, 104-5
 io, *Inachis*, 13, 124
 io, *Nymphalis*, 116, 120
 iphis, *Coenonympha*, 14
 iris, *Apatura*, 9, 13, 114, 116
 Irish Rustic, 65-9
 Iron Prominent, 117
 irregularis, *Anepia*, 64
 jacobaeae, *Callimorpha*, 116
 Jordanita, 53
 jurtina, *Maniola*, 13, 116
 jutta, *Oenis*, 15
 kneuckeri, *Acrobyla*, 51
 knilli, *L. nickerlii*, s.sp., 65-9, Pl. 2 (figs. 4-6)
 lacertinaria, *Drepana*, 116
 lactata, *Scopula*, 117
 lapidea (=leautieri), *Lithophane*, 73
 lapponaria, *Poecilopsis*, 108-9, Pl. 5 (figs. 13 & 15)
 Larch Pug, 117
 Large Blue, 9
 Large Copper, 8, 10, 11
 Large Elephant Hawk, 118
 Large Emerald, 121
 Large Heath, 10
 Large Marbled Tortrix, 122
 Large Nutmeg, 70-1
 Large Ranunculus, 119
 Large Thorn, 119
 Large Tortoiseshell, 8
 Large Twin-spot Carpet, 120
 Large Wainscot, 119, 121
 lariciata, *Eupithecia*, 106, 107, 117
 larnacana, *C. briseis*, 123
 lathonia, *Issoria*, 8, 10, 11, 13
 latruncula, *Procus*, 69-70, Pl. 2 (figs. 1-3, 7-8), 121
 Lead-belle, 109
 Least Carpet, 119
 Least Yellow Underwing, 117, 119
 leautieri (lapidea), *Lithophane*, 73-6, Pl. 9 (figs. 1-6), 102
 legatella, *Chesias*, 116
 lepida, *Hadena*, 64
 leporina, *Apatete*, 120
 lessei, *Euchloe*, 30, 31
 Lesser, Belle, 76-8
 Lesser Lutestring, 118, 121, 122
 leucographa, *Gypsitesa*, 118
 leucophaeria, *Erannis*, 30, 123
 levana, *Araschnia*, 10, 11, 14
 Levant Black-neck, 114
 Lewes Wave, 82-4
 libani, *Z. cuvieri*, 49, 50, 52
 ligea, *Erebica*, 8, 10, 14
 Lilac Beauty, 122
 lineola, *Adopoea*, 10, 13
 lineola, *Thymelica*, 119, 120
 literosa, *Procus*, 116
 Lithophane, 75
 littoralis (litura), *Prodenia*, 58-61 Pl. 1 (figs. 9-12)
 litura, *Anchoscelis*, 118
 litura (=littoralis), *Prodenia*, 58
 Long-tailed Blue, 8, 114, 116
 Lorimer's Rustic, 117
 loti, *Zygaena*, 49, 51, 53, 56
 Lucasia, 53
 lucina, *Hamearis*, 10, 11, 13
 luctuata, *Euphyia*, 95-7, Pl. 9 (figs. 7-11)
 luctuosa, *Acontia*, 120
 Lulworth Skipper, 10
 luneburgensis, *Aporophyla*, 71-3, Pl. 8 (figs. 7-11)
 lunula (nigra), *Aporophyla*, 72
 lutosa, *Rhizodra*, 119, 120, 121, 122
 lutulenta, *Aporophyla*, 72, 121, 122
 lycaonica, *Z. aratensis*, 55
 machaon, *Papilio*, 9, 13, 51
 mackeri, *E. epiphron*, s.sp., 9
 maera, *Pararge*, 8, 11, 4
 Magpie, 121
 Mallow, 120, 122
 malvae, *Pyrgus*, 13
 manlia, *Zygaena*, 52
 Maple Prominent, 120
 Marble White Spot, 118
 Marbled Coronet, 64-5
 Marbled White, 9
 Marsh Fritillary, 9
 maura, *Mormo*, 118, 121
 Mazarine Blue, 8
 Meadow Brown, 116
 Mediterranean Brocade, 58-61
 medusa, *Erebica*, 14
 megera, *Pararge*, 13, 116, 117
 Mesembrynus, 51, 52
 mesopotamica, *E. charltonia*, s.sp., 30
 millefoliata, *Eupithecia*, 121
 Miller, 120
 millieraria, *Eupithecia*, 104, 105
 minima, *Petillampa*, 122
 minimus, *Cupido*, 13, 121
 minorata, *Perizoma*, 97-9, Pl. 6
 mnemon, *E. epiphron*, s.sp., 9
 mnemosyne, *Parnassius*, 10, 14
 morpheus, *Heteropterus*, 10, 11, 14
 Monarch, 7, 8
 Monoctenidae, 80
 Mottled Umber, 116
 Mountain Ringlet, 9
 mucronata, *Ortholitha*, 109
 Mullein Wave, 122
 myriaca, *Hipparchia*, 123
 napaea, *Boloria*, 15
 napi, *Pieris*, 13, 116
 nastes, *Colias*, 10, 14
 nausithous, *Maculinea*, 11, 14
 nebulata, *Euchoeca*, 121
 Neglected Rustic, 122
 New Copper Underwing, 122
 nickerlii, *Luperina*, 65-9
 nigra (=nunula), *Aporophyla*, 72, 122
 niobe, *Fabriciana*, 8, 11, 14
 Niobe Fritillary, 8

- Noctuidae, 47
 norna, Oeneis, 10, 15
 Northern Drab, 120, 121
 Nut-tree Tussock, 120, 122
 Oak Hook-tip, 117
 obeliscata, Therea, 94, 95
 obscura, Procris, 50, 51, 53
 Obscure Wainscot, 119
 obsoleta, Leucania, 119
 obstipata, Nycterosea, 115, 117, 118, 121, 122
 ochrearia, Aspitates, 119
 ochroleuca, Eremobia, 119
 ocularis, Tethea, 120, 122
 oedippus, Coenonympha, 14
 Old Lady, 118, 121
 olivieri, Zygaena, 52
 ononaria, Aplasta, 78–80, Pl. 3 (figs. 1–5), 80
 oo, Dicycla, 122
 Oporinia, 71
 Opsiphanes, 125
 optilete, Vacciniana, 10, 14
 orana, Procris, 53
 Orange Moth, 124
 Orange Sallow, 118, 122
 Orange-tip, 116, 127
 orbitulus, Albulina, 15
 orion, Scolitantides, 10, 15
 oregiata, Lampropteryx, 88–90, Pl. 10 (figs. 1–4)
 palaemon, Carterocephalus, 13
 palaeno, Colias, 10, 14
 Pale Brindled Beauty, 123
 Pale Clouded Yellow, 7, 8
 pamphilus, Coenonympha, 13, 116
 pandora, Pandoriana, 8, 14
 paphia, Argynnis, 13, 121
 papilionaria, Geometra, 121
 parthenoides, Mellicta, 11, 14
 pastinum, Lygephila, 116, 119, 122
 Pauper Pug, 105
 pavonia, Saturnia, 119
 Peacock, 116, 120
 Pearl-bordered Fritillary, 127
 pedaria (= pilosaria), Phigalia, 30
 pendularia, Cosymbia, 86
 pennaria, Colotois, 118
 Peppered, 122
 petropolitana, Pararge, 14
 phoeniciata, Eupithecia, 102–104, Pl. 4 (figs. 1–7)
 philoxenus, C. tullia, s.sp., 9
 phlaeas, Heodes, 51
 phlaeas, Lycæna, 13
 Phoebe, Melitæa, 14
 pilosaria (pedaria), Phigalia, 30, 123
 pirithous, Syntarucus, 8, 14
 pisi, Ceramica, 118
 placida, Zygaena, 49, 52
 plagiata, Anaitis, 86
 plexippus, Danaus, 7, 8, 9, 11, 14, 112
 podalirius, Iphiclides, 8, 11, 14
 polaris, Clossiana, 10, 15
 polychloros, Nymphalis, 13, 124
 pontia, Z. loti, s.sp., 56
 populi, Limenitis, 10, 11, 14
 portata, Cosymbia, 86
 Praviela, 53
 Pretty Chalk Carpet, 117
 pruni, Strymonidea, 9, 13
 procellata, Melanthia, 117
 Procridinae, 47, 48, 49, 50, 51, 52
 Procris, 47, 48, 50, 52, 53
 Procus, 69, 71
 Prodema, 59, 50
 promutata, Scopula, 122
 pronuba, Triphaena, 61, 118
 prosapiaria (= fasciaria), Ellopia, 117
 prunaria, Angerona, 124
 punctum, Zygaena, 54, 55
 pupillaria, Cosymbia, 84–6, Pl. 5 (figs. 1–8)
 Purple-edged Copper, 8
 Purple Emperor, 9, 114, 116
 Purple Hair-streak, 121
 purpuralis, Zygaena, 55
 Puss, 121
 putrescens, Leucania, 123, 124
 Pyralidae, 47
 pyramidea, Amphipyra, 115
 pygarga, Jaspidia, 118
 pyrophila (= simulans), Rhyacia, 57
 quadrifasciata, Xanthorhoe, 120
 Queen of Spain Fritillary, 8
 quercifolia, Gastropacha, 119
 quercus, Thecla, 13, 121
 quercus, Zephyrus, 51
 Rannoch Brindled Beauty, 108
 rapae, Pieris, 13
 ravidia, Spaelotis, 57, 118
 Red Admiral, 8, 113, 116
 Reissita, 51
 Rest Harrow, 78–80
 revayana, Sarrothrips, 122
 Rhagades, 47, 52, 53
 rhamnii, Gonepteryx, 13, 124
 rubricosa, Cerastis, 61
 ridens, Polyphoca, 117, 119
 Ringlet, 118
 rivularis (cucubali), Hadenæ, 64
 Roccia, 53
 rosacea, Z. cambysea, 52
 rostralis, Hypena, 78, Pl. 10 (figs. 5–8)
 Rosy Marsh, 126
 Rosy Minor, 116
 roxelana, Pararge, 123
 Royal Mantle, 120
 rubi, Callophrys, 13
 rubi, Diarsia, 62
 rufata, Chesias, 120
 Rufous Minor, 121
 saadii, Zygaena, 49, 52
 sacraria, Rhodometra, 115, 121
 salicalis, Colobochyla, 76–8, Pl. 10 (figs. 11–13)
 salicis, Leucoma, 118, 120
 Sallow Kitten, 122
 sannio, Diacrisia, 122
 Satyr Pug, 99
 satyrata, Eupithecia, 99, 101
 saucia, Peridroma, 60
 Scalloped Hook-tip, 116

- Scarce Footman, 119
 Scarce Prominent, 121
 Scarce Swallow-tail, 8
 scolopacina, Apamea, 120
 Scotch Argus, 9
 scotica, *C. tullia*, s.sp., 9
 scotica, *O. mucronata*, s.sp., 109
 Scottish Large Heath, 9
 seitzii, *Zygaena*, 49, 52
 selene, *Clossiana*, 13
 semele, *Hipparchia*, 13
 semiargus, *Cyaniris*, 8, 13
 September Thorn, 117, 120
 Seraphim, 119
 serratulae, *Pyrgua*, 14
 sertoniui, *Spialis*, 11, 14
 Shaded Pug, 118
 Sharp-angled Carpet, 122
 Short Clasped Treble Bar, 86–88
 Short-cloaked, 116
 Short-tailed Blue, 8
 sifanica, *Boloria*, 10, 14
 Silver-studded Blue, 121
 Silver-washed Fritillary, 121
 Silver Y, 121
 Silvery Arches, 122
 silvicola, *Carterocephalus*, 10, 14
 simonyi, *Reissita*, 47, 51
 simulans (pyrophila), *Rhyacia*, 57–8,
 60, Pl. 1 (figs. 1–3)
 sinapis, *Leptidea*, 13
 Six-spot Burnet, 118
 Slender Brindle, 120
 Sloe Carpet, 119
 Small Blood Vein, 117
 Small Blue, 120
 Small Brindled Beauty, 123
 Small Emerald, 117
 Small Heath, 116
 Small Rivulet, 119, 120
 Small Scallop Wave, 121
 Small Skipper, 10, 117, 121
 smaragdaria, *Thetidea*, 80–1, Pl. 3
 (figs. 6 & 9)
 sobrinata, *Eupithecia*, 105
 sordens (basilinea), *Apamea*, 70, 71
 Speckled Wood, 116
 sphinx, *Brachionycha*, 118, 121
 Spring Usher, 124
 spini, *Strymon*, 11
 spinosissimus, *Echinops*, 51
 spinosus, *Echinops*, 51
 Sprawler, 118, 121
 Square-spot Rustic, 120
 statilinus, *Hipparchia*, 11, 14
 staudingeriana, *Z. corycia*, 52
 stellatarum, *Macroglossum*, 113
 Stone Pinion, 73–6
 Stout Dart, 118
 strataria, *Biston*, 124
 Straw Belle, 121
 Streak, 116
 Streamer, 122
 strigilis, *Procus*, 69, 121
 subrosea, *Coenophila*, 126
 subsolana, *Procris*, 53
 subumbrata, *Eupithecia*, 107, 118
 suffumata, *Otregiata*, 88
 sulcimanica, *Z. loti*, s.sp., 49, 53
 sultana, *P. graeca*, 53
 sultana, *Z. ganymedes*, s.sp., 55
 Sussex Emerald, 81–2
 svenssoni, *A. pyramidea*, s.sp., 115,
 117, 118, 120, 122
 Swallow Prominent, 116, 117
 Swallowtail, 9
 sylvestraria, *Sterrhia*, 120
 sylvestris, *Thymelicus*, 117, 121
 syriaca, *Z. filipendulae*, 53
 syringaria, *Apeira*, 122
 tages, *Erynnis*, 13
 tamara, *Zygaena*, 52
 taurica, *Z. carnioleica*, 55
 Tawny Minor, 69–70
 teleius, *Maculinea*, 14
 Theresimima, 47, 52, 53
 thersites, *Lysandra*, 14
 thore, *Clossiana*, 15
 tincta, *Polia*, 122
 tithonus, *Maniola*, 117
 tithonus, *Pyronia*, 9, 11, 13
 tityrus, *Heodes*, 8, 10, 11, 14
 transcaspica, *E. charlonia*, s.sp., 30
 transversata, *Philereme*, 118
 tremula, *Pheosia*, 116, 117
 tridens, *Apatele*, 117
 trifolii, *Zygaena*, 118, 119
 Triphaena, 57
 tripunctaria, *Eupithecia*, 101
 tritici, *Euxoa*, 120
 True Lover's Knot, 119
 tullia, *Coenonympha*, 9, 10, 11, 13
 typhae, *Nonagria*, 118
 typica, *Naenia*, 120
 umbra, *Pyrrhia*, 119, 120
 umbrifera, *O. mucronata*, s.sp., 109
 unangulata, *Euphyia*, 122
 urticae, *Aglais*, 13, 120, 124
 varia, *Lycophotia*, 119
 variata, *Thera*, 92–5, Pl. 10 (figs. 9 &
 10)
 Varied Coronet, 63–4, 115, 119, 120
 venata, *Ochlodes*, 13
 venus, *Leto*, 31
 versicolor, *Procus*, 69, 121
 Vestal, 115, 121
 vetulata, *Philereme*, 118, 122
 villica, *Arctia*, 119, 121
 vinula, *Cerura*, 121
 virgaureae, *Heodes*, 14
 virgaureata, *Eupithecia*, 99–101, Pl. 8
 (figs. 1–6)
 virginiensis (huntera), *Vanessa*, 7, 8, 9,
 11, 14
 viridata, *Chlorrisa*, 82
 vulgata, *Eupithecia*, 101
 vulpinaria, *Sterrhia*, 119, 120
 w-album, *Strymon*, 13
 Wall, 116
 Waved Black, 121, 122
 Weaver's Fritillary, 8
 White Admiral, 9, 121
 White Banded Carpet, 95–7
 White Line Dart, 120

White Marked, 118
 White Satin, 118, 120
 White-spotted Pinion, 121
 wiltshirei, *Z. corycia*, s.sp., 52
 xanthographa, *Amathes*, 118, 120
 xanthomelas, *Nymphalis*, 8
 xanthomista, *Polia*, 127
 Xanthorhoe, 91, 92
 Xylena, 75
 Yellow Belle, 119
 yemenicola, *R. simonyi*, 51
 ypsilon, *Apamea*, 120
 ypsilon, *Agrotis*, 120
 Zygaena, 47, 48, 49, 50, 51, 52
 Zygaenidae, 47, 48, 50, 54
 Zygaeninae 47 48, 50, 51, 52

MAMMALIA

Chinchilla, 26
 laniger, Chinchilla, 26

MYRIAPODA

lagurus, *Polyxenus*, 36

PSOCOPTERA

alboguttatus, *Peripsocus*, 45
 bifasciata, *Amphigerontia*, 43
 bostrychophilus, *Liposcelis*, 43
 briggsi, *Ectopsocus*, 46
 burmeisteri, *Caecilius*, 46
 cruciatus, *Graphopsocus*, 46
 cyanops, *Cuneopalpus*, 44
 dali, *Trichopsocus*, 45
 didymus, *Peripsocus*, 45
 enderleini, *Embidopsocus*, 43
 Epipsocidae, 43
 fasciata, *Loensia*, 43
 flavidus, *Caecilius*, 46
 fuscipennis, *Caecilius*, 46

gibbosa, *Psococera*, 44
 guestfalica, *Cerobasis*, 43
 helvimacula, *Reuterella*, 45
 hyalimus, *Elipsocus*, 44
 immaculatus, *Stenopsocus*, 46
 immunis, *Mesopsocus*, 45
 inquilinus, *Lepinotus*, 42
 kelloggi, *Pteroxanium*, 42
 kolbei, *Caecilius*, 46
 laticeps, *Mesopsocus* (*Haloneura*), 45
 Lepidopsocidae, 43
 Liposcelidae, 43
 Liposcelis, 43
 lucifugus, *Epipsocus*, 43
 Maclachlani, *Elipsocus*, 44
 Mesopsocidae, 44
 nebulosus, *Metylophorus*, 44
 pedicularia, *Lachesilla*, 46
 phaeopterus, *Peripsocus*, 45
 picicornis, *Philotarsus*, 44
 Polypsocidae, 46
 Pseudocaeciliidae, 45
 Psocidae, 43
 Psyllipsocidae, 43
 pulsatorium, *Trogium*, 43
 putruelis, *Lepinotus*, 42
 quisquiliarium, *Kolbia*, 46
 ramburii, *Psyllipsocus*, 43
 reticulatus, *Lepinotus*, 43
 rostocki, *Pseudopsocus*, 45
 sexpunctatum, *Trichadenotecnum*, 44
 simulans, *Leposcelis*, 43
 stigmaticus, *Stenopsocus*, 46
 subfasciatus, *Peripsocus*, 45
 subfuscus, *Liposcelis*, 43
 terricollis, *Leposcelis*, 43
 Trogiidae, 42
 unipunctatus, *Mesopsocus*, 45
 variegata, *Loensia*, 44
 westwoodi, *Elipsocus*, 45

SALTATORIA

parallelus, *Chorthippus*, 38
 sylvestris, *Nemobius*, 25

ERNST MAYR LIBRARY



3 2044 114 230 063

